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Newton, Mass. - Efficiency Survey - 1916

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City of Newton, Massachusetts



Engineering Survey

of the

Departments of Streets, Forestry
and Water

And their Allied Functions

Report to His Honor Edwin O. Spilde

Frederic A. Colwell

Inspector, City of Newton

October, 1913



NEWTON, MASSACHUSETTS

EFFICIENCY SURVEY

OF THE
DEPARTMENTS OF STREETS
FORESTRY AND WATER
AND THEIR ALLIED FUNCTIONS

REPORT TO HIS HONOR EDWIN O. CHILDS

BY

EDWIN A. COTTRELL

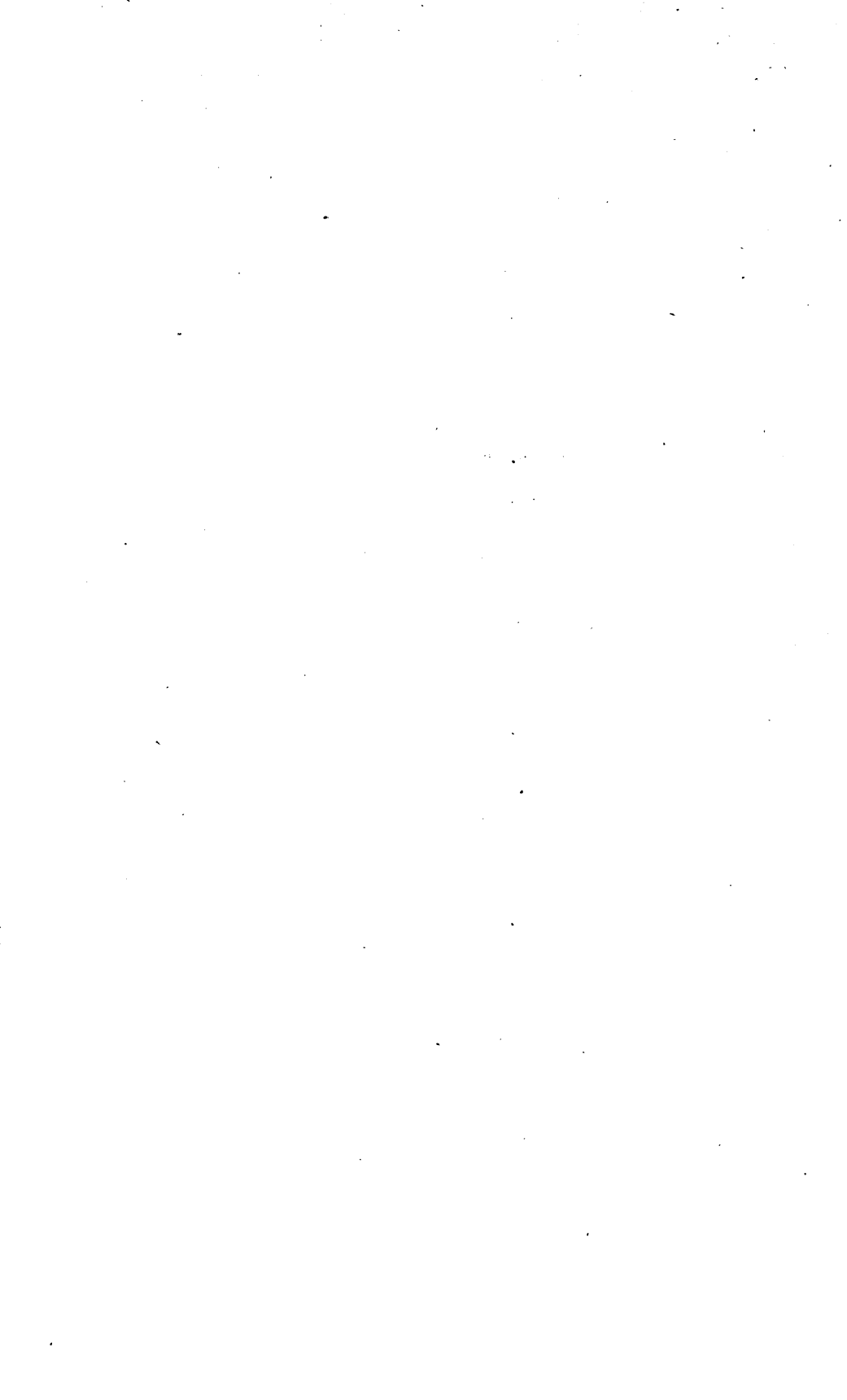
WELLESLEY, MASSACHUSETTS

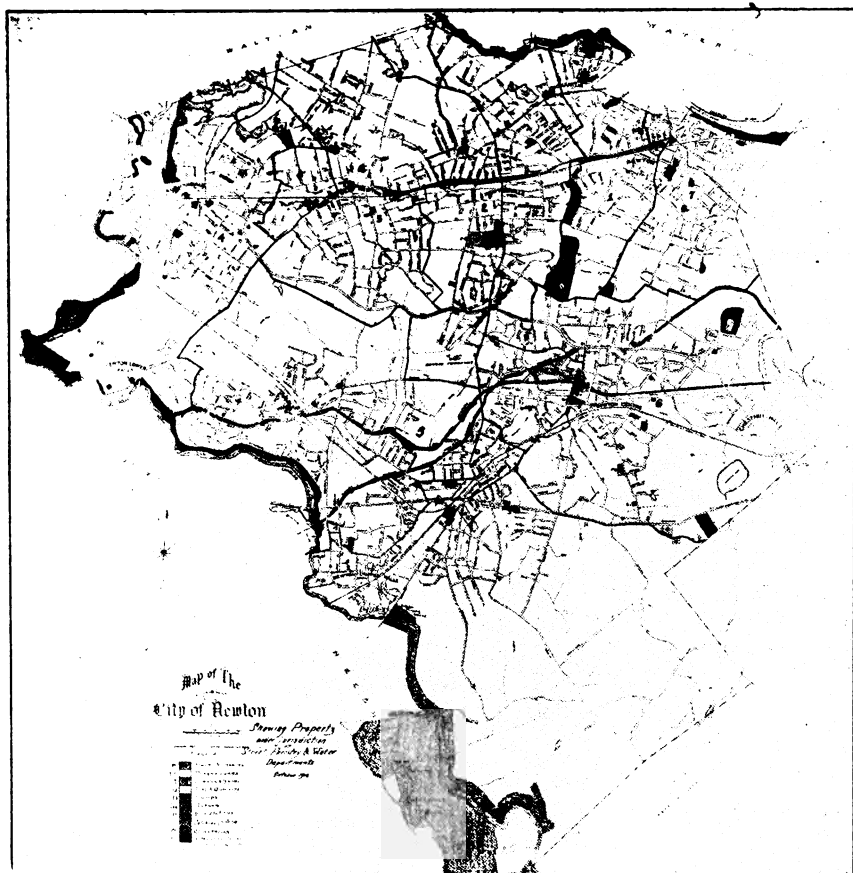
OCTOBER, 1916

NEWTON, MASS.
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EDWIN A. COTTRELL
Lecturer in Government
Investigator of Municipal Administrative Departments

Wellesley, Mass, October 1st, 1916.

Honorable Edwin O. Childs,
City Hall, Newton, Mass.

Your Honor,—

I transmit herewith my report as Efficiency Expert, in which position I have had the honor to serve your city for the past six months.

This survey does not attempt to set up an ideal standard or imaginary picture of municipal government. It does not compare the functions and expenditures of the city with conditions which are expected to exist in a well-managed, profit-making corporation. It aims to measure a reasonable, practicable public service and compare the accomplishments of other municipalities in so far as conditions are comparable. It tests the methods employed by the various departments by standards which Newton should set for itself and which are usually demanded by its taxpayers.

The report confines itself to:—

1. A description of conditions found,
2. The necessity for change of methods to procure increased efficiency, and
3. To promote the future plans of the administration.

I wish to extend through you my appreciation for the uniform consideration and aid given by the members of the administration and employees of the city.

Very sincerely,

EDWIN A. COTTRELL.

EXTRACT FROM THE REPORT OF THE PUBLIC
WORKS COMMITTEE OF THE BOARD OF
ALDERMEN, DECEMBER 31st, 1915.

"In the course of our year's work and more recently during our investigations made preparatory to the submitting of this report, we have had occasion to observe at reasonably close range how the work and business of various city departments are conducted. We are impressed with the feeling that while the work of the city is conducted with absolute honesty and fidelity, there are many economies which could be effected through unification and consolidation of some of the work conducted by various departments. While the Board of Aldermen, through its committees and individual members can conduct investigations into these matters, and make certain remedial recommendations, its members cannot in addition to all of their other duties spare sufficient time to thoroughly investigate all of the numerous problems presented. Furthermore, this work requires the experience of a trained expert in civic affairs.

"We therefore believe that a city expert, unfettered by any political ties or obligations, and able to devote his entire time to the city, should be employed for a reasonable period to examine into and report on the work of the city, and more especially upon its various outside plants and properties, and to recommend to the proper officials the adoption of such changes as will insure to the tax payers of the city the maximum efficiency in the conduct of its affairs. The terms of such employment and the scope and extent of the investigation should be carefully considered before engaging such expert in order that the city may not

unwittingly be made a party to the expenditure of money in excess of the value of the service rendered."

Respectfully submitted,

BERNARD EARLY, Chairman,
JOHN S. ALLEY,
HENRY I. HARRIMAN,
REUBEN FORKNALL,
HARRY D. CABOT,
FREDERICK W. COBB,
ROBERT M. CLARK,

Committee on Public Works.

EXTRACT FROM THE INAUGURAL ADDRESS OF
HIS HONOR EDWIN O. CHILDS, JANUARY 1st, 1916.

"In talking with the able Chairman of the Public Works Committee in one of the many helpful conferences which we have had from time to time, the suggestion has been made by him that an expert in municipal affairs might be employed with profit to the city to look over the workings of the different departments and to make suggestions whereby further economies might be made so that the maximum efficiency at the minimum cost might be obtained. The suggestion appeals to me very strongly, and I would welcome most heartily such a move."

Introduction

Aim of Survey

Method of Comparison

INTRODUCTION

The aim of this survey, as stated in the previous pages, is to examine the departments usually covered by the term "Public Works" and determine:—

1. Obvious virtues and defects,
2. Administrative efficiency or inefficiency,
3. Future improvements.

This survey then takes up the analysis of the existing procedure under:—

1. General internal organization,
2. Field methods employed,
3. Office methods employed,
4. Methods of accounting,
5. Methods of planning,
6. Costs,
7. Labor,
8. Purchasing,

of the departments of Streets, Water, Forestry, and the Power House (at the request of His Honor the Mayor).

A variety of methods is used in making comparisons. It is obviously impossible to make such comparisons with fairness and accuracy. Private corporations, which are profit-making in essence, are usually either poorly organized or on such high plane of detail that comparisons mean but little. Elements of the cost of work in other cities render comparisons difficult under any conditions. The use of tables showing comparisons on the basis of population and per capita costs are of little value when extent and conditions of the work are unknown. Municipal reports fail to give sufficient detail to form accurate conclusions and only by personal inspection and first-hand study can the proper comparisons be drawn.

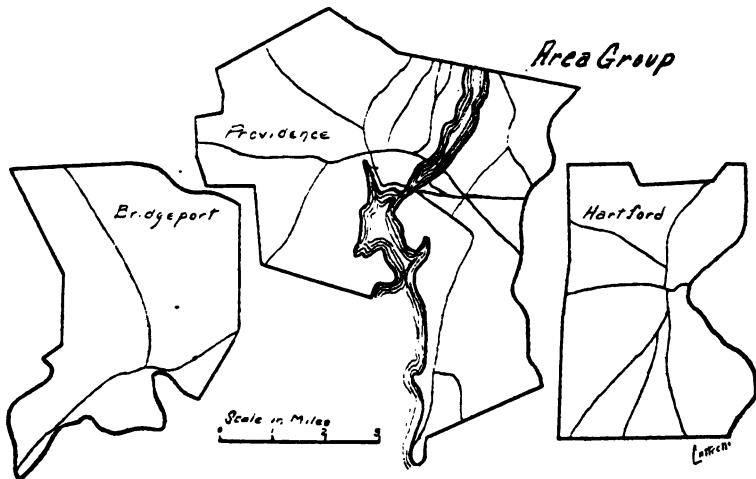
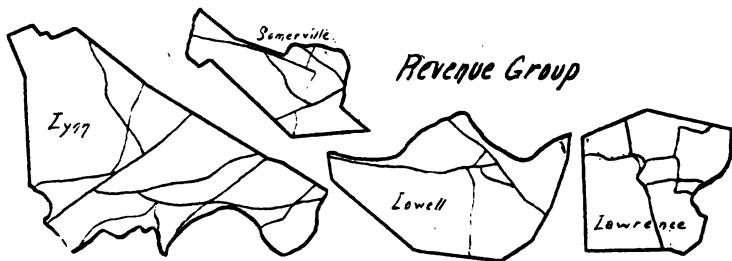
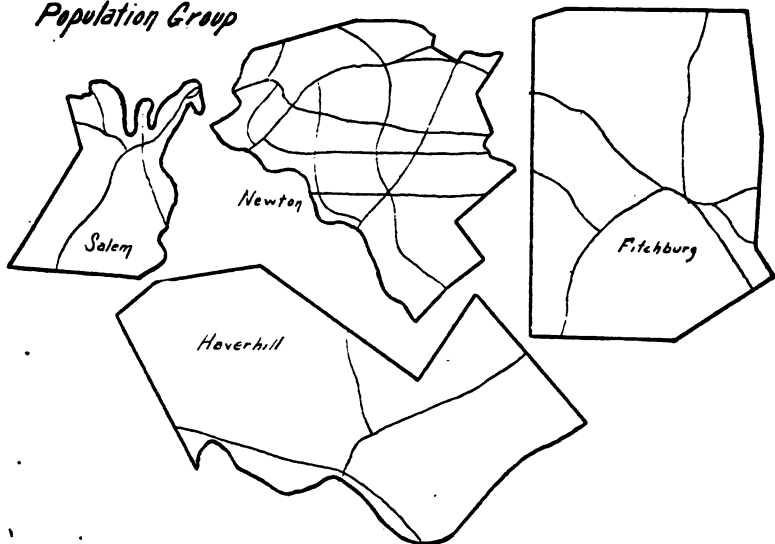
Three methods of personal inspection and comparisons are used in this report :—

1. On the basis of population as followed by the United States Census and the Massachusetts Bureau of Statistics. The cities in this class are Haverhill, Salem and Fitchburg.
2. On the basis of revenue received, covering Lawrence, Lowell, Lynn and Somerville.
3. On the basis of area, covering Providence, Hartford and Bridgeport.

A study of the chart on the following page will show the inequalities of such comparisons when population and area are really the ruling factors in determining municipal expenditures. In the first group Newton ranks third in both population and area and yet receives twice as much revenue as each of the other cities. In the second group Newton receives approximately the same revenue yet is three to four times as large in area and only about one-third as large in population. In the third group Newton has the same area yet only one-third to one-sixth of the population. Obviously then, on the face of these comparisons, we find that figures based on either population, revenue or area must be brought as near the actual conditions of expenditure as possible and this could only be accomplished by the personal inspection method. I have covered the organization and functions, accounting, equipment and labor of the various departments of the cities named in this way and any criticism of methods employed in Newton are the results of this inspection and study.

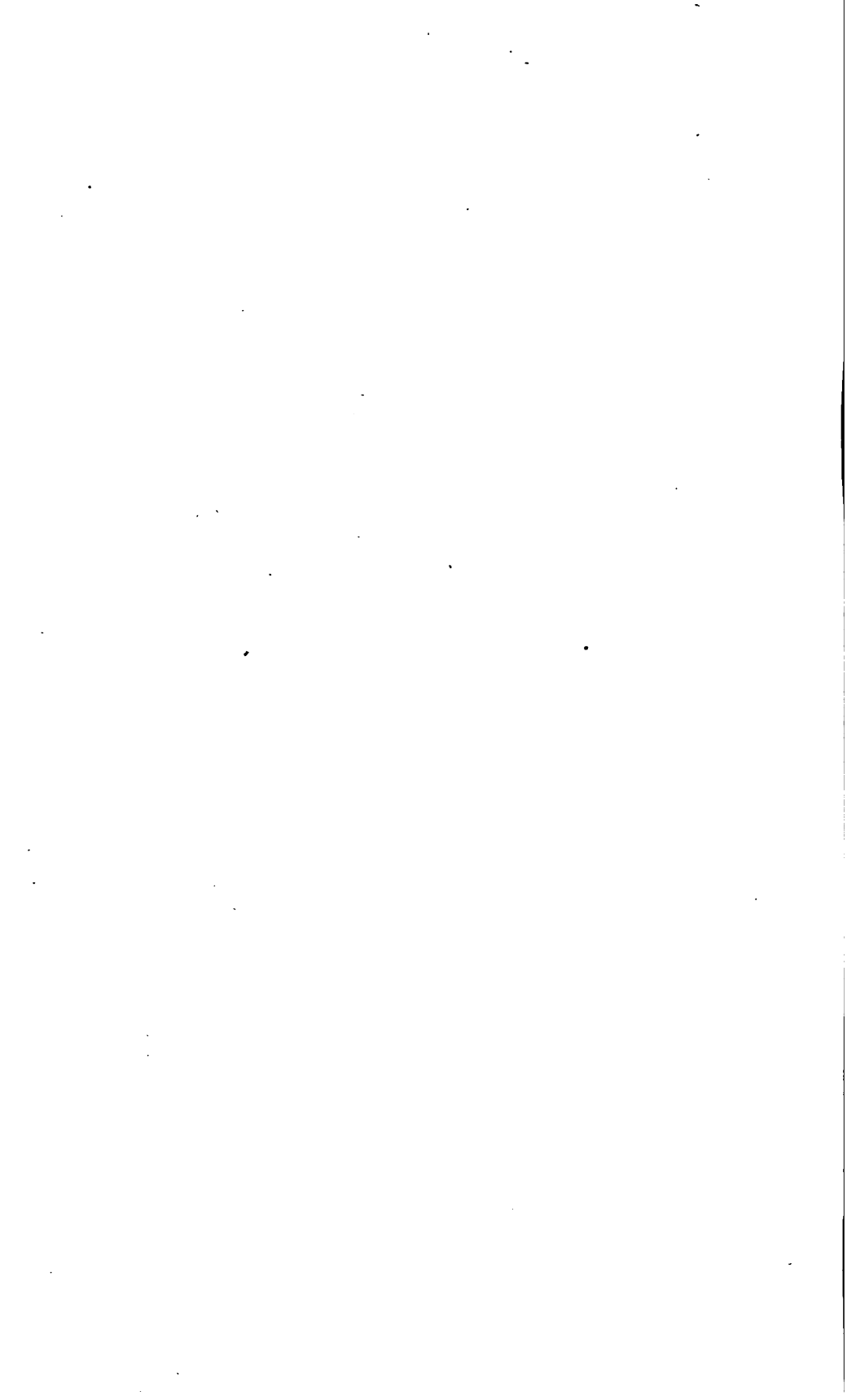
A detail study of the charts of this report will leave the firm belief that expenditure in many of the municipal departments must of necessity increase and the reasons are clear to those who are familiar with construction or maintenance work as performed by the municipality. It is not too large an estimate to place the increase in supplies, materials and labor at from fifty to sixty per cent for the last ten years. Added to this must be figured the increasing

Comparative Areas of Cities in Three Groups *Population Group*



shorter hours of labor, holidays and vacations with pay, pensions and disability compensation. The main conclusion drawn is that the municipality must follow the natural channel of economy and efficiency by an exercise of the most intelligent effort and the installation of labor and time-saving devices and machinery. Service to the taxpayers is paramount and demands for increased municipal facilities must be met in one of two ways—increased taxes or strict economies. Some will argue that what the people demand they will pay for. Others, that waste and inefficiency are the cause of this increased tax. Both are right, but the competent official will avoid penurious economy and have only in view the greatest welfare of the people and not the effect of the tax-rate upon his future. Critics of many administrations raise vicious, revengeful and selfish attacks in order to embarrass and if possible dislodge officials. A detail study of the work of each department as presented in its annual report would give ground for, or arguments against, such attacks. Citizens view the surface evidence of work performed and little realize the struggle going on between the department and the appropriating body. Two views must be clearly seen—work demanded and source of revenue. The attempt is made in this report to show the actual working of each department studied and then recommend necessary changes to the appropriating body. Large tables of figures have been studied and are here expressed for the sake of brevity in the simple graphic curves. Directness and conciseness have prompted me to omit much of the process of reasoning by which results are reached but those experienced in municipal work will agree with the conclusions presented. Municipal government is business. It is business which requires a broad judgment, a clear vision, an intimate knowledge of the needs of the entire city, and a study of the ways to effect the wisest economy. Personalities are of far greater importance than political beliefs in the determination of these matters and the citizens are responsible for the selection of personalities best fitted to exercise the authority which is given them under the existing laws and ordinances.

**Physical and Financial Statistics
of Newton**



Physical and Financial Statistics of Newton

The following charts and tables are given in this survey for general comparisons and to show various means by which the administrator and the citizen may study the finances of his city. Detailed comment is not made except under the discussion of each department studied and reference to certain figures herein contained will be made in later sections of the report.

The physical statistics given on the next page can be easily compared with those of the cities studied in the various classes of population, area and revenue. This comparison is important in showing the necessity for various forms of expenditures and will explain the differences in many of the figures used in the financial tables and charts.

Newton has two hundred and twenty-four miles of streets which is nearly equal to Providence and two to three times that of other cities. In miles of sewers one hundred and twenty-five and one-half, Newton is exceeded by only Providence and Lowell. In parks and playgrounds, Newton has an area exceeded only by Providence. The average daily water consumption of two million eight hundred and thirty thousand gallons is only one-fourth to one-half of most cities. The number of gallons per day per consumer, sixty-four and nine-tenths, is above the general average and the percentage of services metered, ninety and six-tenths, is far above the average. In water mains, one hundred fifty-seven and eight-tenths; hydrants, one thousand and eighty-two; stop-gates, one thousand and thirteen; services, nine thousand and eighty-six; and average cost of service, thirty-one dollars; Newton also exceeds the average for other cities.

STATISTICS OF THE CITY OF NEWTON—1915**Villages 15**

Population 1915 census 43,113

Property owners 11,523

Total area of city, about 18 square miles

Land 11,106 acres, Water, 300 acres

Area taxed 8,971 acres

Greatest extent north and south, about 4.25 miles

Greatest extent east and west, about 4.50 miles

Park areas 231.34 acres; Metropolitan Park 119 acres

Playgrounds 13 with 123.3 acres (included in Park area above)

Streets 224 miles—Accepted 145 miles, Unaccepted 79 miles

Telford 9 miles

Macadam, single roadway 76 miles

Macadam, double roadway 6 miles

Gravel 69 miles

Earth roads 64 miles

State road 1.03 miles

Concrete walks and crossings 108.15 miles

Concrete gutters 16.95 miles

Water mains 158.50 miles; Metropolitan 13.97 miles

Catchment area 700 acres (100 in Newton, 600 in Needham)

Sewerage system—

Sewage only 125.55 miles; Metropolitan 2.94

Surface water only 65 miles (including 4.10 miles of improved brooks built with open channels)

River front 11 miles

Steam railroads 11.9 miles

Electric street railway 27.4 miles (single track 15.3, double track 12.1 miles)

Street lights 1,067 gas; 162 arc; 1,827 incandescent

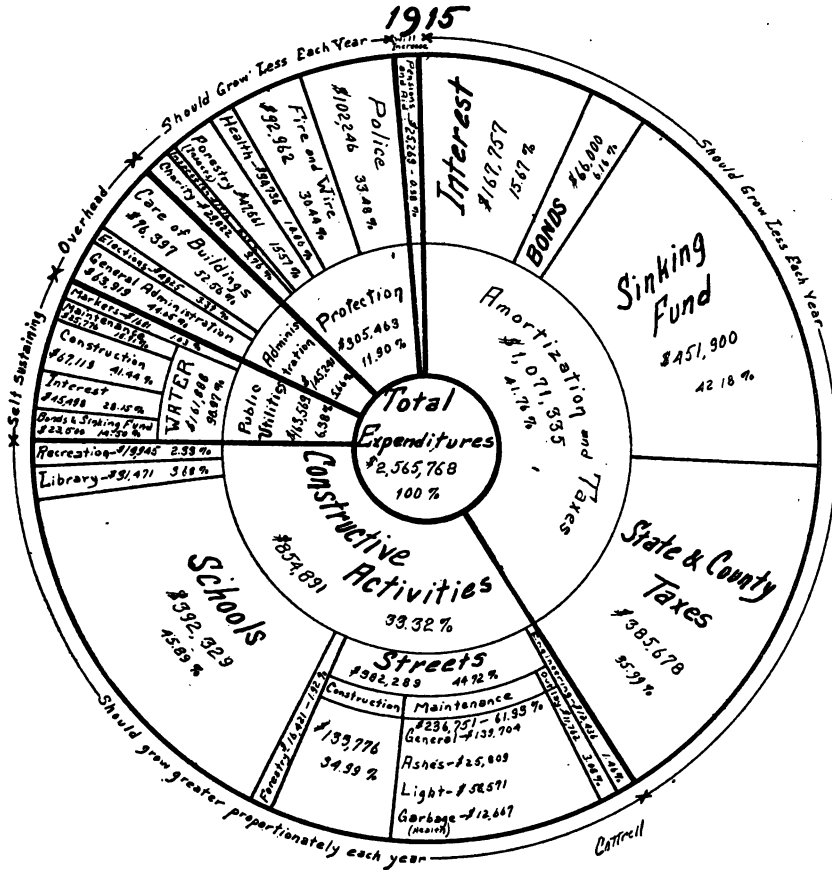
Public Buildings—City Hall, Garage, 7 Stables and yards, 30 School houses, 11 Fire stations, 4 Police stations, 10

Post offices, State armory, 3 Pits and quarries

Other buildings—Houses 7,761, Churches 45

Tax rate \$18.50 on \$1,000—Total Valuation \$94,902,388.

NEWTON, MASS.
FUNCTIONAL PROPORTION OF EXPENDITURES



PER CAPITA NET PAYMENTS

The table on the following page is taken from the latest report of the Bureau of the Census and shows the Per Capita Net Payments for Specific Departmental Expenses. This table varies from the one which follows in that the latter uses the figure for the total budget appropriation while the Census figures are for the specific purposes shown.

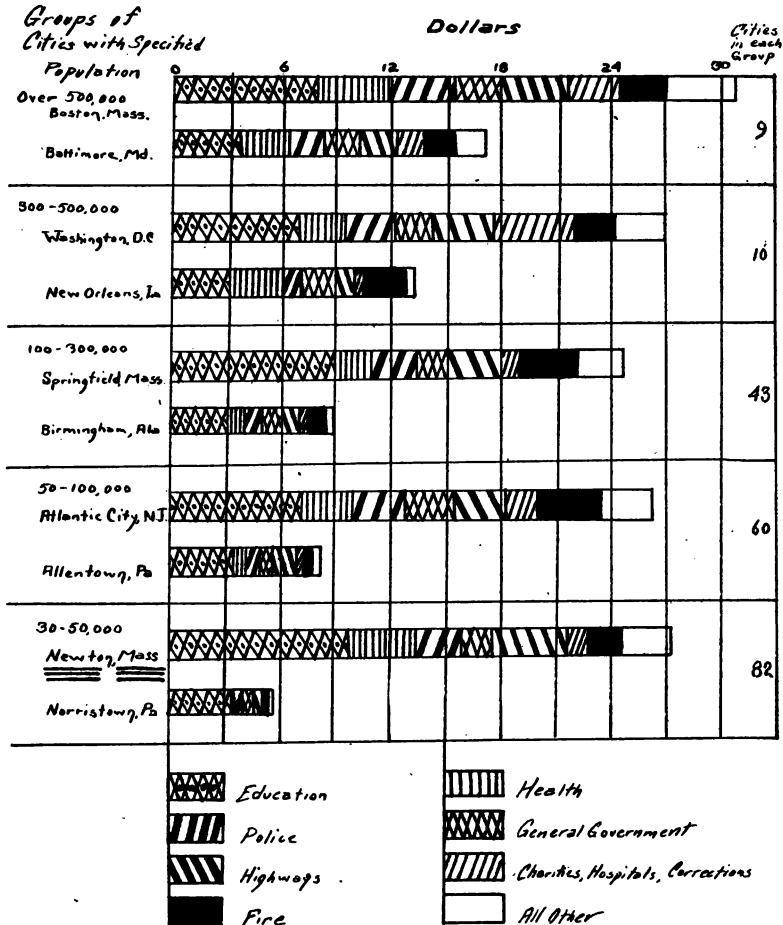
The per capita net payments for all cities have increased from \$13.19 in 1903 to \$18.45 in 1915 or an increase of 39.9 per cent. For the more important 146 cities we find an increase from \$24.64 in 1903 to \$34.53 in 1915 or an increase of 40.0 per cent while Newton has increased from \$32.21 in 1895 to \$36.00 in 1915 or an increase of only 11.7 per cent.

This table is based on the following figures:—

COST PAYMENTS—1915

Function	Total	Per Capita
General Government	\$79,109	\$1.86
Protection Persons and Property		
Police	102,201	2.41
Fire	78,807	1.86
All other	10,896	0.26
Conservation of Health	25,754	0.61
Sanitation	108,267	2.55
Highways	153,884	3.62
Charities, Hospitals and Corrections	37,386	0.88
Education		
Schools	407,528	9.60
Libraries	32,549	0.77
Recreation	101,096	2.38
Miscellaneous	4,767	0.11
General	4,161	0.10
Total	\$1,146,405	\$27.00

*Per Capita Net Payments for Specific
General Departmental Expenses
by Groups of Cities with Specific
Population: 1915*



*Taken from U.S. Census—Financial Statistics of
Cities having a Population of over 30,000: 1915*
Page 96, Diagram 16.*

Highest and lowest city in each group

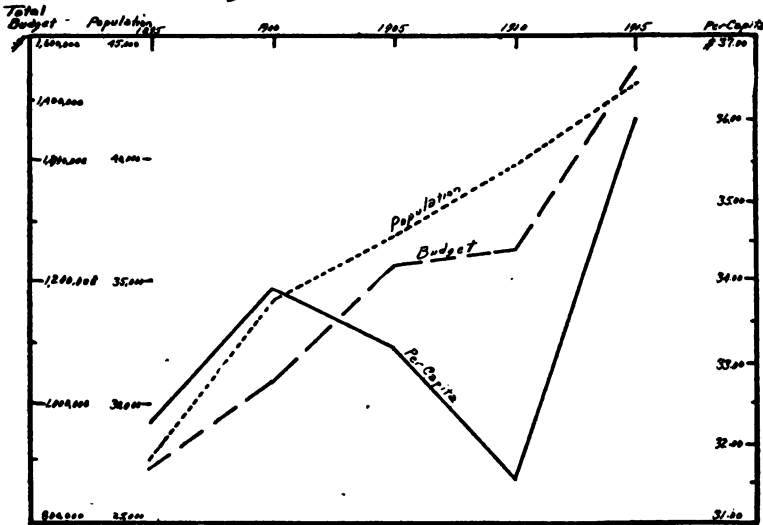
In these figures it will be seen by an examination of the table that Newton exceeds the next highest in education, highways, and "all others," which includes forestry, parks and playgrounds, etc. It ranks number two in health, number four in police and fire, and number five in charities and general government.

**PERCENTAGE OF ALL PAYMENTS FOR EXPENSES
OF GENERAL DEPARTMENTS—1915**

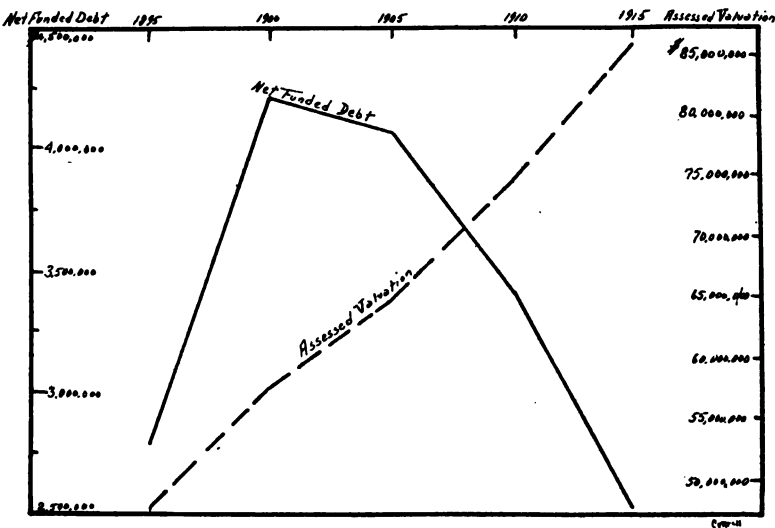
FUNCTION	<i>Average of all cities in United States of 30,000 Population</i>	<i>Average of Seven Mass- achusetts Cities</i>	<i>Newton</i>
GENERAL GOVERNMENT	11.4	6.6	6.9
POLICE	11.3	8.6	8.9
FIRE	8.8	10.2	6.9
ALL OTHER PROTECTION	1.9	1.1	1.0
HEALTH	2.2	3.2	2.2
SANITATION	7.9	8.2	9.4
HIGHWAYS	11.2	14.0	13.4
CHARITIES, HOSPITALS, AND CORRECTIONS	6.8	7.8	3.3
SCHOOLS	30.2	30.8	35.5
LIBRARIES	1.3	2.0	2.8
RECREATION	3.7	3.0	8.8
MISCELLANEOUS AND GENERAL	<i>Omitted</i>		

The figures of this table show Newton to be above the average in the percentage of payments for expenses of the departments under sanitation, highways, schools, libraries

Chart Showing Per Capita Expenditures-1895-1915



*Chart Showing Net Funded Debt & Assessed Valuation
1895-1915*



and recreation. It is below the average in general government, police, fire, all other protection, health and charities.

The first chart on the preceding page shows the per capita expenditures for the past twenty years based on the total budget appropriations. The increases shown follow the normal line of municipal development. Expressed in figures we find:—

	1895	1915	Per Cent Increase
Budget appropriation	\$888,811	\$1,560,009	75.5
Total Expenditures	2,622,521	3,684,897	40.5
Population	27,590	43,113	56.2
Per Capita Expenditure	32.21	36.00	11.7

The second chart shows a most healthy condition in the relation of the funded debt to the assessed valuation.

Net Funded Debt	\$2,782,376	\$2,536,049	8.8 decrease
Assessed Valuation	47,401,344	85,945,659	83.0 increase

It is interesting to note that the recent Census figures give Boston and Newton as the two highest per capita total assessed valuation cities using the 100 per cent basis in the United States.

STATE AND MUNICIPAL TAX RATES—1916

	Newton	Average of seven Massachusetts Cities
Polls	11,658	18,729
Property	\$98,091,454	\$71,188,875
State Tax	\$17.51	\$13.72
Municipal Tax	\$18.90	\$20.88
Average tax for all cities and towns		\$18.56

SPECIFIED ASSETS AND VALUE OF PUBLIC PROPERTIES—1915

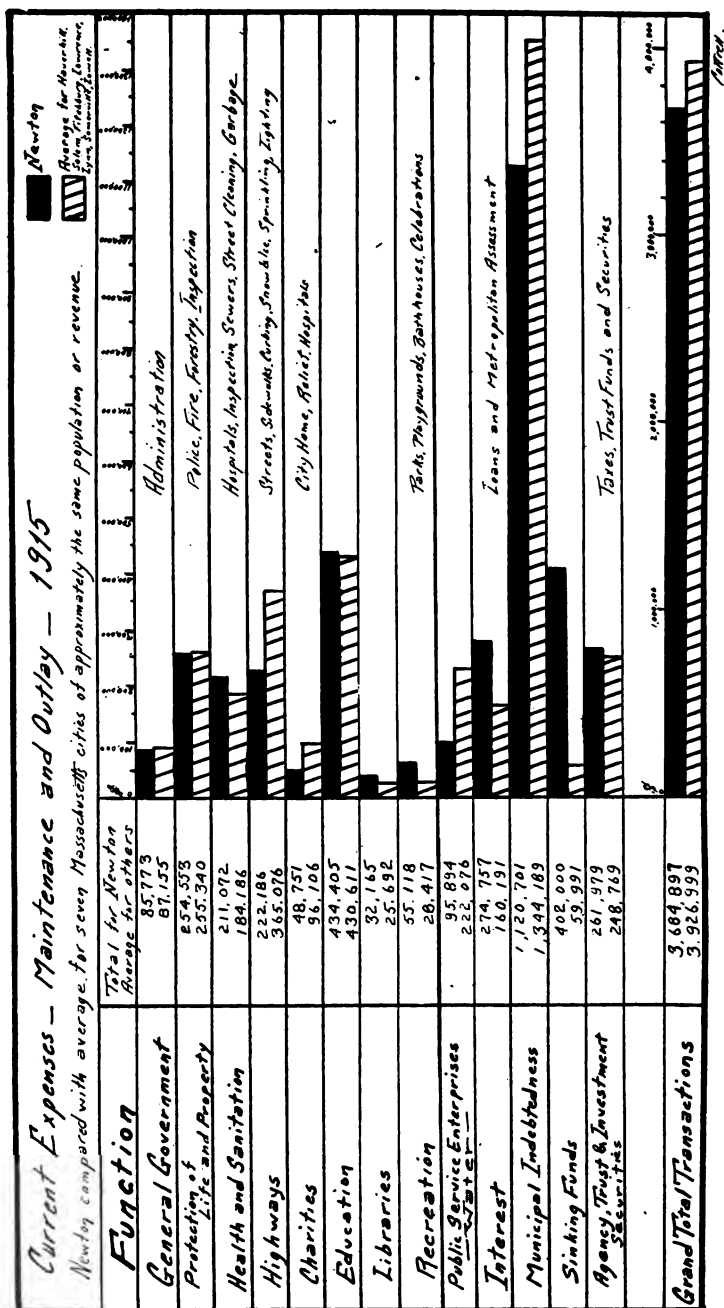
	Newton	Average for seven Massachusetts Cities
Aggregate	\$8,278,497	\$6,412,323
Sinking Funds	2,468,347	778,009
Value Public Property	5,516,079	5,449,803

CURRENT EXPENSES—MAINTENANCE AND OUTLAY

In the chart on the following page a comparison is made between the current expenses for maintenance and outlay of Newton with the average for the seven Massachusetts cities of the same population or revenue. The figures show that Newton is higher than the average in the expenditures for Health and Sanitation, Education, Libraries, Recreation, Interest, Sinking Fund, and Agency, Trust and Investments. It is lower than the average in the expenditures for General Government, Protection of Life and Property, Highways, Charities, Public Service Enterprises (Water), and Municipal Indebtedness.

Another grouping of the figures would show that Newton has a total for maintenance which is lower, interest charges which is higher, and debt requirements which is lower than the cities of either group.

A study of the figures for maintenance and outlay of the eight cities in the two groups for the last six years shows the following number of cities increasing or decreasing in the expenditures of the different departments. "N" designates Newton.

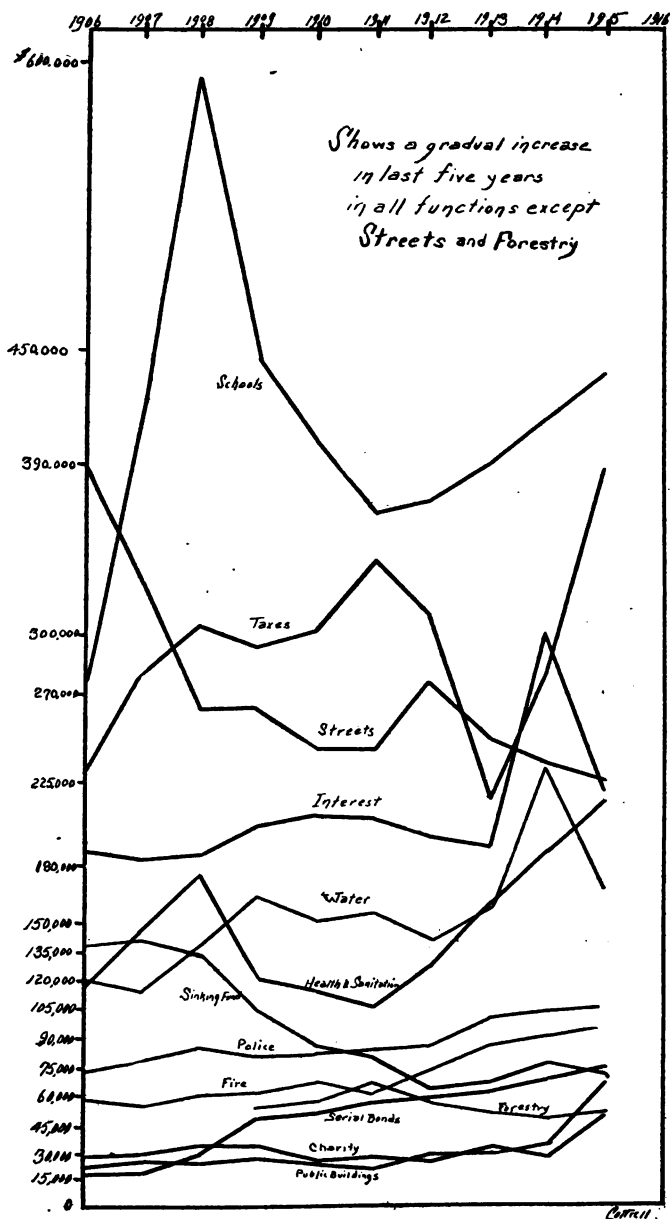


Department or Function	Increase	Decrease	No change
Grand Total Transactions	5	1 N	2
General Government	6		2 N
Protection of Life & Property	7 N	1	
Health & Sanitation	5 N	3	
Highways	5	2	1 N
Charities	7 N	1	
Education	5	1	2 N
Libraries	3	4 N	1
Recreation	2 N		6
Public Service (Water)	8 N		
Interest	6	1 N	1
Municipal Indebtedness	4	1 N	3
Sinking Funds	* 2 N	3	1
Agency, Trust & Investment			
Securities	2	4 N	2

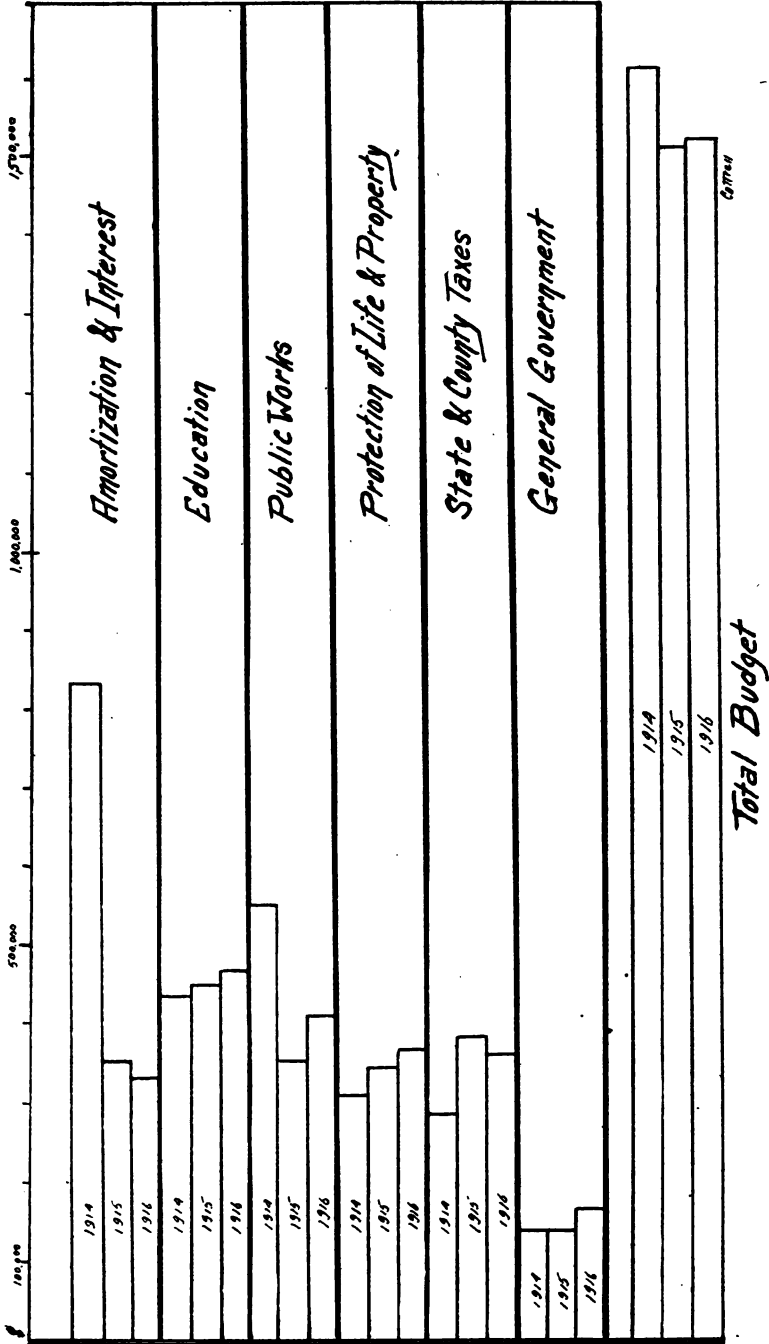
* Two cities are without Sinking Funds.

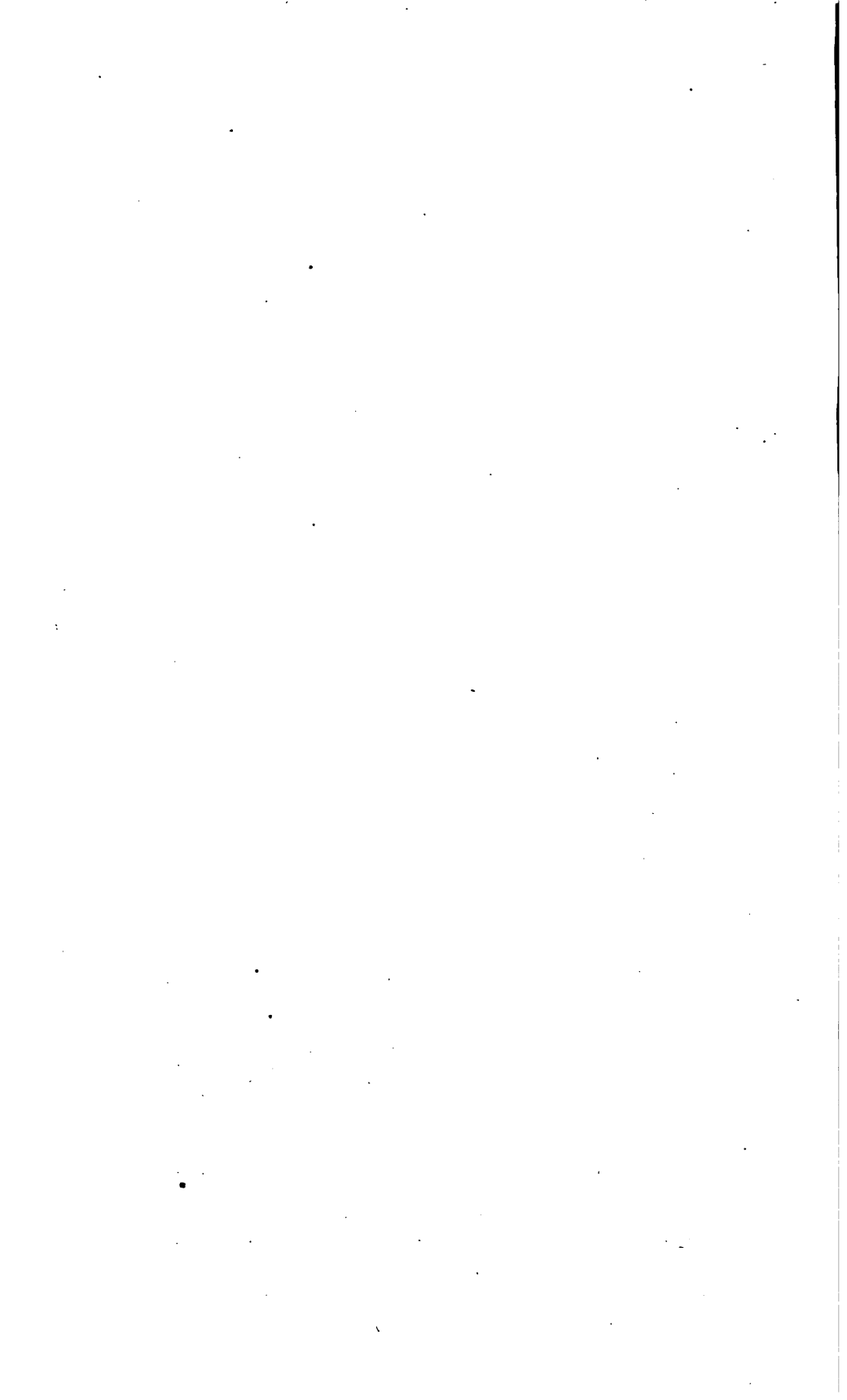
The result of this study of the expenditures over a period of six years shows that Newton has increased in Protection of Life and Property, Health and Sanitation, Charities, Recreation, Water, and Sinking Funds, has decreased in the Grand Total, Libraries, Interest, Municipal Indebtedness, and Agency, Trust and Investment Securities; and remains the same in General Government, Highways, and Education.

Newton, Mass.
Ten Year Comparison of Some
Department Expenditures 1906-1915

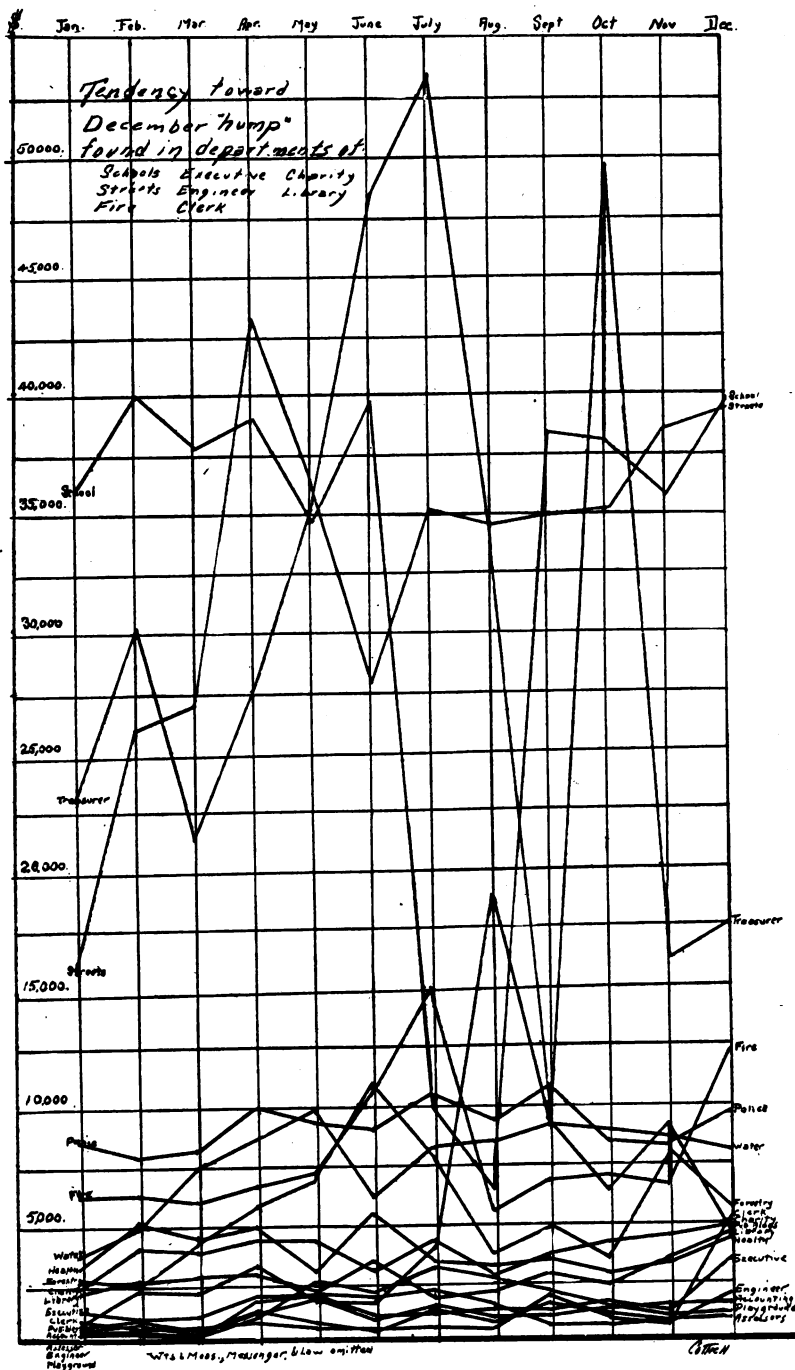


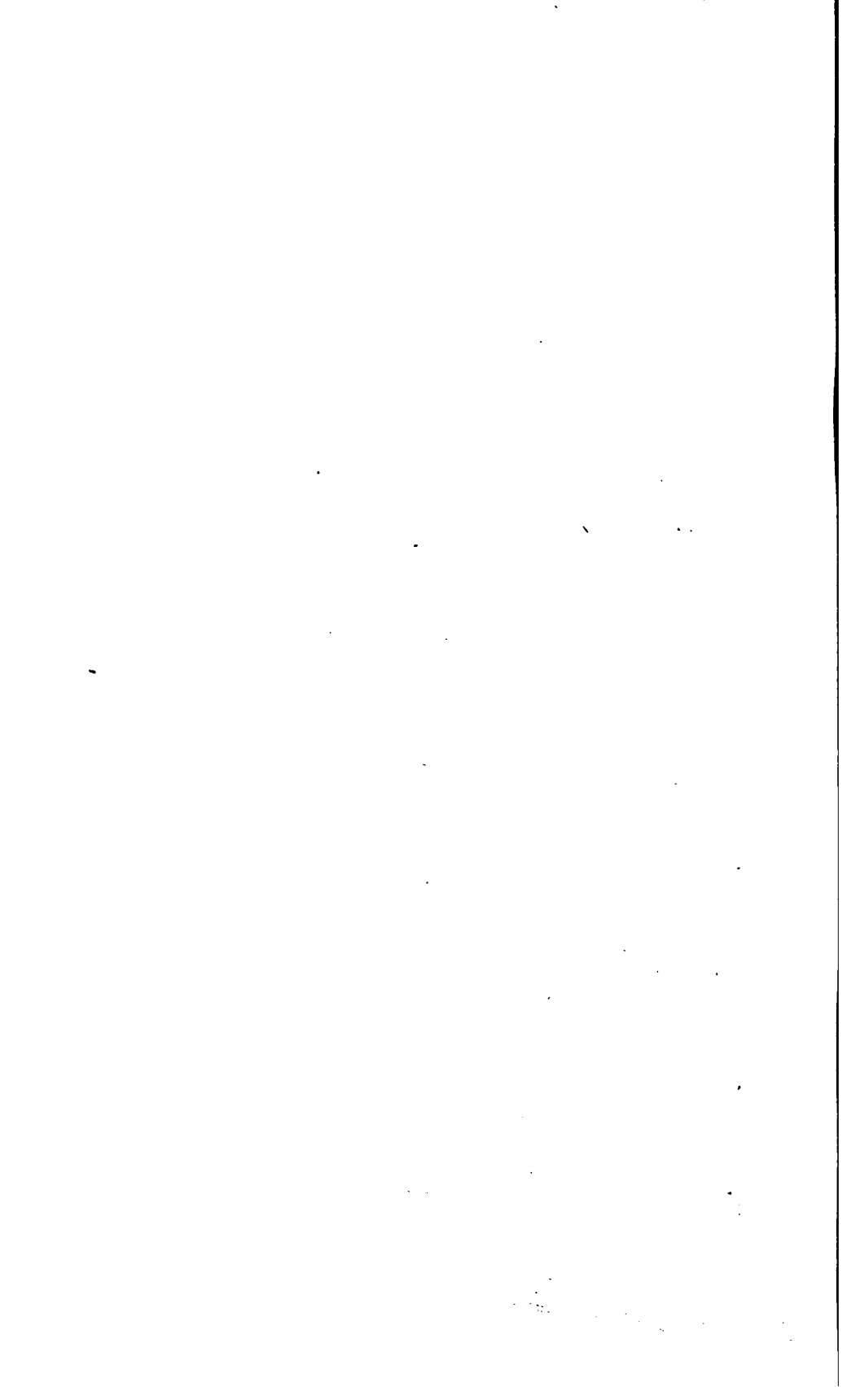
Newton, Mass. — Comparison of Annual Expenditures — 1914, 1915, 1916 (estimated)





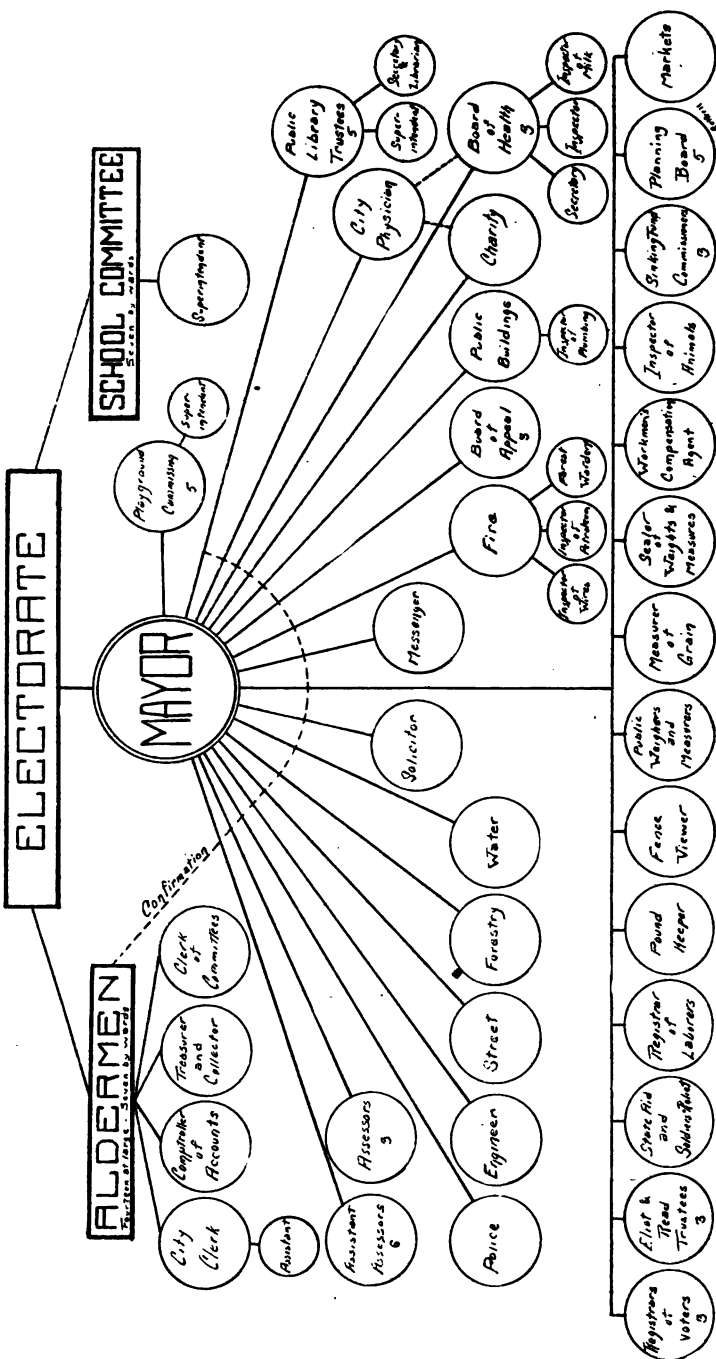
Newton, Mass. - Department Monthly Expenditures - 1915





General Government
Organization
Efficiency and Economy
Annual Reports

NEWTON, MASS. ORGANIZATION OF GOVERNMENT 1916.



GENERAL GOVERNMENT

The accompanying chart of the organization of the government of Newton shows in detail the lines of responsibility to the electorate. In many cities this organization has proved ineffective as presenting a divided responsibility between the mayor and the board of aldermen. Appointments by the mayor (except the Playground Commission) are confirmed by the aldermen and the results and conditions of co-operation in this arrangement in Newton are superior to those usually found. Speaking comparatively, Newton is better organized and functionally managed than most cities and the emphasis upon responsibility is more closely drawn. Executive responsibility through appointment of officials (except those elected by the aldermen), budgetary control and unofficial leadership of policy give this system less friction than many others. Friction has no place in the effective administration policy, and the principles of a successful business corporation with president and board of directors acting in unison should be applied to the management of the city's affairs. The citizens have recognized that continuity in government is necessary and being beneficiaries of governmental efficiency and victims of inefficiency, have continued the policies of the administrative heads by general re-election of those in control of appointments.

The position of the mayor in this organization gives him the opportunity of formulating many helpful policies within the various departments. His executive oversight of expenditures enables him to keep close watch on each individual. Periodic conferences with department heads would enable him to form a common administrative policy in regard to many of the recommendations contained in this report or in his annual address. This has been accomplished in the excellent system of accounting now in use in

the city and with the advise of the comptroller many more economies may be accomplished. Other suggestions which might be helpful conference topics are central purchasing, annual reports, working hours, uniform salaries, efficiency records, methods of promotion, common use of equipment, education of workers, and a central bureau of information.

A functional organization chart of each department under survey is shown and criticism of the organization of each is given in the text under the respective departments. In listing the functions of each department in detail, one is able to ascertain an overloaded or underloaded department or division, conflicts in authority or jurisdiction, and any overlapping of functions. Emphasis can be placed on the important function to be performed and consolidation of positions may be accomplished. Unnecessary positions and steps in detail can be abolished. Laxity in supervision and habits of work can be corrected. I have found in this survey many conflicts in authority between the three departments under study and between these departments and those of Engineering, Public Buildings and Playgrounds. Instances of this conflict are cited later and lead me to believe that a study of the work of all departments in their relations to each other would make for much saving in time and money.

The only point of consideration to be mentioned here is the oft proposed consolidation of all the departments studied with the addition of Engineering and Public Buildings into one department of "Public Works" with separate divisions. It would be impossible to make any great saving in such a consolidation. The real argument is that the Water department is primarily a public service, separately financed and essentially a trading enterprise which requires a different type of managerial ability from the others mentioned. Forestry or aboriculture is a science which few men have mastered and one of special training and ability is required to operate this scientific function. Engineering is common to many departments and can best be operated in a separate department subject to the call of all. The care of public

buildings and public grounds sometimes conflict but the present arrangement of having the Forestry department care for public grounds seems more reasonable than any consolidation (except adding Playgrounds—see later under Forestry).

The argument that consolidation would allow for saving in use of labor, materials, equipment and supplies and the interchange between divisions is now covered by the successful operation of the "Supply Account" under the accounting system, and the opposition of the Civil Service Laws which prohibit a free interchange of labor and would require special legislation to become effective.

In general the functional organization is adequate, properly supervised and presents a small field for criticism except in the particulars found under each department.

EFFICIENCY AND ECONOMY

Efficiency is the accomplishment of a given result with the minimum expenditure of effort.

Economy is the minimum expenditure of money consistent with the accomplishment of that result, or the best possible public welfare with the least cost.

Municipal administration has to contend with certain legal requirements and the practical necessity of satisfying the double demand of more service and lower taxes. All three must be satisfied and the problem of efficiency attempts to solve the dilemma of the administrator. Private business is far from the ideal of efficiency and yet publicity of records and results demand a closer scrutiny by the citizen and a measure by which judgment may be formed. In the municipal field records and results are usually at hand and it is a well known fact that reports of private business receive a wider circulation and more intensive reading than those of the municipality.

Efficiency means the proper study of:—

1. Organization and methods—
Is there a proper unifying of functions?
Are the methods employed competent or lax, wasteful and antiquated?
2. Personnel—
Are the administrators trained?
Is there honest incompetency present?
3. Equipment—
Are up-to-date appliances and labor-saving devices used?
Is it properly cared for and guarded against too rapid depreciation?
4. Planning—
Is program of work planned with eye to future requirements?
Is work planned necessary?
Are future economies possible?
Is department co-ordinating properly with others?
5. Cost Accounting—
Is budget making successful?
Are accounting records adequate?
Are cost accounts properly kept?
Does the system detect and control waste?
6. Inspection—
Is work accomplished satisfactorily?
Is timekeeping and reporting adequate?
7. Purchasing and testing—
Are specifications standardized?
Are contracts satisfactory?
Is storekeeping adequate?
Are purchases up to standard?
8. Reporting—
Are annual reports clear and concise?
Can improvements be made?

Are plans and estimates checked by accomplishments?

Are employees helped by criticism or education?

9. Interpretation by citizen—

Is he co-operating for usefulness?

Can amount of work be materially increased by stimulus of inquiry?

Is ignorance of conditions banished?

Are politics avoided?

Are real needs presented?

Are facts worth presenting?

These are the processes now employed to drive waste and incompetency out of municipal government and to make the administration live up to certain standards and requirements. Many losses are attributed to lax purchasing of supplies and materials, poor supervision of working forces, lack of proper system of accounting, political favoritism and the worst forms of graft and stealing. Success in management is the knowledge of picking men and the ability to get the most out of the organization at one's disposal. No business succeeds without organization and it lies within the power of the people to demand efficiency, responsibility and proper business methods in the government of their city. No reduction in efficiency is justified and rigid economy is possible without impairment of results. By these standards given above we are able to measure each of the departments and find in the conclusion where Newton stands when the yardstick has been applied.

Taxpayers demanding economies may affect these by helping in work of betterment. Complaints are a proper measure of municipal accomplishment but too often take the form of superior wisdom. The distorted sense of petty complaints compared with the work of the city as a whole should be remembered. Compliments and application of work performed very seldom reach the department heads. The use of streets, sidewalks, schools, parks and other fa-

cilities bring the citizen into direct contact with results. Study of reports should inform him of costs and give an up-to-date statement of facts as opposed to the usual misinformation of rumor. He would learn what his government really is, what it is doing, results obtained and costs which he is called upon to meet. He would find that his tax-rate is lower than any city in its class and that the property valuation is double that of other cities of the same population and smaller than that of cities of the same size and larger population. He would also find that his State tax is double that of other cities in his population class and the same as cities of smaller area and much larger population. Also that increasing costs of administration are brought about by increasing demands for his own safety by improvements in sanitation, fire prevention and living conditions, and for his own comfort in easier and quicker modes of communication.

A study of some of the charts and tables under "Financial Statistics" will bear out these statements and give the citizen some reasons to take a closer interest in the government of his city.

ANNUAL REPORTS.

Chapter II Section 15 of the Revised Ordinances of the city requires "All boards and officers of the city shall make a written report to the Mayor at the close of the year of their doings for the year with such suggestions and recommendations as they deem proper." They are also required to report their receipts and expenditures for the year but as this function has been taken over by the Comptroller there is no reason for a duplication of material except to show detail of operation.

The following quotation from the Eighth National Tax Conference, page 367, explains the necessity of a proper reporting system:—

"The electorate must pass judgment upon the work which its servants do. It does not have this knowledge, the legislature does not have it. Electors vote and the legislature passes appropriation bills without authentic facts before them. Ignorance of public work, its difficulties, its effects, and its cost ; and indifference—the product of ignorance—are probably the most fundamental causes of inefficiency in public service."

The first requisite of a report is promptness of issue. It is possible to have these reports submitted, as required, at the close of the year and printed immediately. Historical reports are of no value for determining current problems. Many of the reports have been printed and issued during the summer months and that of the Water department had not appeared when this report was written. Intelligent budgetary action is impossible without the results of the past year clearly laid before the legislative body by the executive and committees of the board of aldermen. These results are contained in the annual reports and should be in the hands of each member of the board before appropriations are voted for the next year.

The second requisite is brevity and conciseness. Only the most significant facts, well digested and condensed, are necessary to explain the work of the department during the past year.

The third requisite is the proper collection of material. Too many municipal reports are burdened with detail of expenditures, trial balances, inventories of property, copies of franchises, specifications and contracts, etc., which should be on file in the proper offices and open to inspection rather than printed as information. What the few people who read these reports want to know is cost of operation and plans for the future. To satisfy this demand the reports should include the revenues accrued and expenses of the various functions performed itemized by salaries, wages, supplies, materials, equipment, etc., and giving unit costs if possible. Compari-

sons with past years through the use of tables, percentages or graphic charts are instructive and effective. By this method the citizen can be informed of the detail of operations of the public business and have a permanent record of historical statistical facts which are necessary to proper administration.

The practice of printing separate reports for each department is very economical as citizens are usually interested in some one point in a single department and do not wish the complete volume. A great saving is made by this practice and is worthy of mention. There is, however, a tendency to pad these reports in certain departments or to spread the small amount of material through many pages with resulting blank spaces or useless bulk and heavy printing expense. Reports are printed for information to citizens, officials, other cities, students, etc., and not to furnish bulk work for printers. The reports published during the years 1915 and 1916 could be reduced in volume at least one-third and in printed matter at least one-fourth and still retain the information necessary to inform the citizens of the cost and methods of operating their government. Copies of specifications and contracts need not appear but once if at all. In the Street department report for 1915, thirty-nine of the sixty-eight pages are unnecessary in a document of this sort. Much of the material in the report of the Engineer appears in other departments and could be condensed to cover the work which the engineer has performed. The Forestry department prints the most interesting and instructive report of any similar department in the country. The subject matter leads to its use in an educational way and its statistics are clear, concise and well presented. Its value compensates for its bulk. The report of the Water department is short and well digested and covers all that is necessary for comparative purposes. Much criticism could be made of the reports of other departments but is without the jurisdiction of this report. Comparisons between those mentioned and those omitted will lead to a

possible desire to have the reports edited by a central bureau. This practice has been tried in several places and leads to uniformity in presentation and elimination of useless repetition.

One of the duties of the executive in the connection of reporting is to keep the citizen interest alive and to emphasize the most important facts of his administration. Constant vigilance on his part is responsible for large savings and more efficient services and he should be the one to inform the public of the acts of his subordinates. The first step in this direction was the publication of a most informing series of articles in pamphlet form by the Clerk of Committees. This information should be in the hands of every citizen and school teacher and would do a large amount of good in concentrating responsibility for effective management, in eliminating personalities and politics from municipal business, in leading the citizens to propose improvements, make inquiries and submit reasonable complaints.

The mayor is in a peculiar position at the present time. Receiving an exceedingly small salary, he cannot devote his entire time to the duties of his office. Many hours are necessary for office duty and the routine of legislative and accounting functions. Effective supervision requires that he visit in person the work performed by various departments and be adequately informed by this inspection of the efficiency of his subordinates. At present this is impossible without a great sacrifice on his part and I would recommend that there be established a bureau of inspection and information which would be his official eye and general publicity bureau. This bureau would be able to make special inquiries whenever necessary, would keep the public informed of all acts of the administration, would promote the effectiveness of the executive by constant supervision of all work in progress, and in general improve the administrative methods of the city. It is an established fact, in municipal as well as private business, that constant supervision is a great time and money saver and an added stimulus

to efficiency and economy of operation. This bureau would be able to satisfy the increasing demands made upon administrative heads for information relative to their departments by chambers of commerce, bureaus of municipal research, teachers and students of government, other city officials, and all who are making municipal government the subject of special study. Newton has much valuable information to impart for the cause of better municipal government and a bureau of this sort would be a most enlightening step in advance.

There is a possibility of combining this recommendation with that of an editor for the annual reports and with two others which appear in later pages of this report, i. e., secretary to the Board of Contract and Supply, and Central Pay Roll Clerk, thus centralizing inspection and reporting in one office.

ACCOUNTING

Introduction

Purposes

Methods Employed

- 1. Forms**
- 2. Classification**
- 3. Reports**
- 4. Purchasing**
- 5. Discount**
- 6. Inventory**

Recommendations

INTRODUCTION

Efficiency is not possible without an excellent accounting system properly administered and not too elaborate in detail or burdensome in practice. Expenses are kept at a minimum, economy practiced and excess authority prevented by this adequate supervision.

The system in Newton is of the latest approved style and furnishes uniformity in accounting methods and forms which facilitates current comparisons of cost and service. It is accurate, prompt, and systematic in its recording and reporting of receipts, maintenance, job costs and balances, and furnishes the Mayor and Board of Aldermen the necessary information for the consideration of the budget, and the department heads with their necessary financial data.

PURPOSES

The functions of the Comptroller of Accounts are to keep a complete set of books and accounts of all transactions of the city, receive all accounts, claims, bills and payrolls approved and certified, examine and approve or disallow them, draw all warrants on the treasury for payment and record all temporary and funded loans, rate of interest thereon and time when principal and interest are payable.

These functions show all the work done by the city and are a true reflection of the organization, character of expenditures and methods of financing. They make a proper measure of the administrative, equipment, material and wage efficiency of the city by an examination and comparison of costs, methods and information from all departments. They work against unbusinesslike management and encourage cooperation among the officials.

This system accomplishes or should accomplish :—

1. Centralized bookkeeping
2. Uniform classification and distribution of expenditures
3. Full collection of revenue
4. Revenues credited to proper accounts
5. Monthly reports of receipts
6. Check orders and contracts
7. Record outstanding liabilities and prevent overpayments
8. Report costs of administration, operation and maintenance
9. Establish assets of the city
10. Check work performed
11. Check delivery of supplies for quantity and quality
12. Check employees on payrolls
13. Operate supply account
14. Fix responsibility of officers in approving vouchers
15. Give information to Mayor, Aldermen, Department Heads and general public
16. Check efficiency and promote economy.

METHODS EMPLOYED

1. FORMS

The above purposes are accomplished by the use of a large number of forms, too many, in fact, to give here in great detail.

All bills, accounts, payrolls and claims are approved and certified by the heads of departments and sent to the comptroller on or before the fourth day of the month or on Monday of each week. They are accompanied by a schedule showing date, to whom due, appropriation to which charged and amounts therefor. These schedules are based upon the daily reports of the foremen for labor, teams, equipment, materials and labor and are copied on classified cards and footed by the department each week. The comptroller then totals the classification with the appropriate account and enters the proper charges, credits

the supply account and sends a report of balances to the department head. The certification of all payrolls and vouchers is examined and checked with the time reports, requisition duplicates and bills received. Orders have been made out in triplicate and bills received in duplicate. Department bills receivable for sewer, water, sidewalk or moth work are sent out by the departments or through the Assessors and are paid to the Collector. Department receipts are sent to the Treasurer and a statement sent by him to the Comptroller.

The department time and service reports for payrolls are adequate. All employees in the three departments studied are paid while at work by a paymaster. The heads of some of the departments receive all the checks or envelopes and pay their men. This practice is open to great possibilities of abuse and should be prohibited.

There are uniform blanks used for payrolls, requisitions, civil service lists and reports to the Industrial Accident Board. The other forms used are explained under each department but come under the direct supervision of the comptroller in most cases. He does not have a proper check on the original labor records or receiver record of supply yard material of the departments nor does he give the departments details of the unit costs which are essential in proper administration.

I would recommend that a central payroll clerk be placed in this office who would supervise the entire salary and wage force of the city. This position would prevent any abuse of padded payrolls, check up the time of each employee and greatly diminish the work of clerks in the departments. This addition would bring the purchase of supplies, the stock-keepers' inventories, labor employment, cost-keeping accounts and payment warrants under one head, where it is intended to be, and give him adequate means of checking all expenditures of the city with the returns in labor and materials.

CLASSIFICATIONS

The classifications used are, as nearly as possible, uniform throughout the departments. Space prohibits my giving the

excellent and adequate detail employed in this system. There is a proper distribution and adjustment of all charges and accurate information as to cost of each function, sub-function or division of a sub-function for the weekly, monthly, quarterly or annual period, and it is readily obtainable by all department officials, legislative committees or the general public.

3. REPORTS

The Comptroller makes an annual report to the Mayor which follows the form prescribed by the Massachusetts Bureau of Statistics but giving much more detail than required by the bureau.

Monthly or weekly statements are sent to the Mayor, Board of Aldermen and department heads showing the balance of appropriations ungranted, balance of grant and expenses to date of each item of the account.

4. PURCHASING

The operation of this department enables a check to be placed upon the prices paid for similar materials and supplies in all departments. At present there is no authority vested in the Comptroller to refuse payment because of variation in the amounts charged unless they are exorbitant. By the installation of a central purchasing system, which I recommend elsewhere, many difficulties would be solved and particularly the establishment of commodity cards and file of current trade catalogues to check prices.

5. DISCOUNT

The city receives one and a half or two percent discount on about one-third of its supply bills for payment within fifteen days. The largest purchases of coal, feed, stone, tar, etc., do not receive discounts because bought under contract prices and

delivered periodically. Practically none of the local dealers give discounts and yet they are invariably paid within ten days after submission of their bills. The present practice of requiring prompt duplicate bills and paying all bills of one dealer by one check deserves consideration on the part of the dealers. I would recommend that a uniform practice of requiring at least two percent discount for fifteen day payments be installed. Purchases could then be made in the market where the most favorable consideration was shown.

6. INVENTORY

The present practice is for each department to make an annual physical inventory and appraisal of its property and report to the Mayor. This practice should be brought in touch with the office of the Comptroller. I would recommend at least a monthly inventory, operated on the fluid basis, and reports made to and checked by the Comptroller for the Mayor. I would also recommend the establishment of a property ledger which would be maintained in the office of the Comptroller.

RECOMMENDATIONS

Bring all departments to the detail and exactness of those studied and save large amounts through purchasing and controlling functions.

Establish cost records in department offices.

Monthly inventory reported and recorded in property ledger.

Discount all bills at two percent for fifteen day payment.

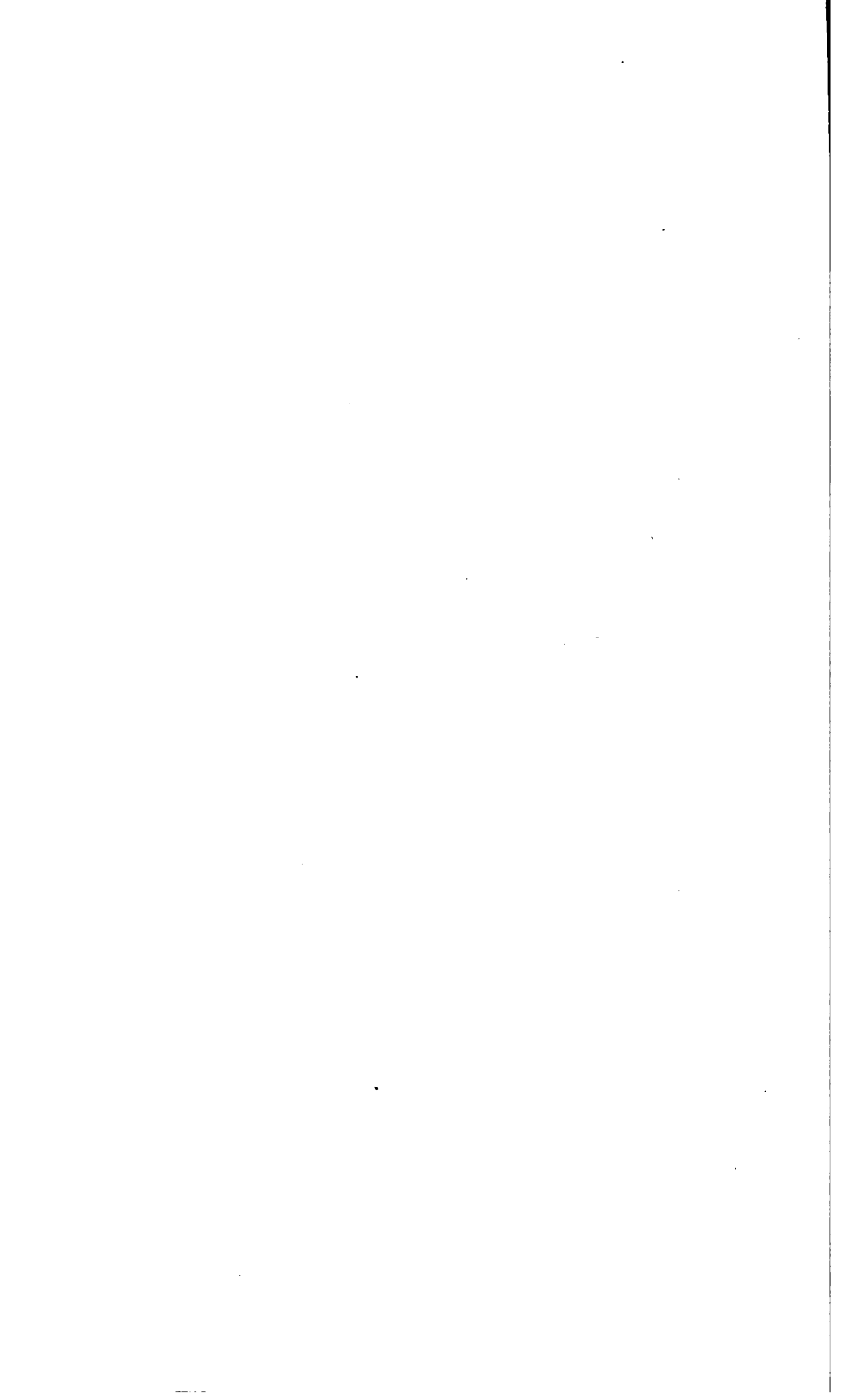
Establish the office of central payroll clerk.

Pay all employees personally through the paymaster or treasurer.

Charge depreciation of equipment.

Use item of "unworked time" in all departments where labor is employed.

Increase "overhead" in all accounts to at least fifteen percent.



STREET DEPARTMENT

**Organization and Jurisdiction
Office**

Yards, Stables and Equipment

Pits and Quarries

City Garage

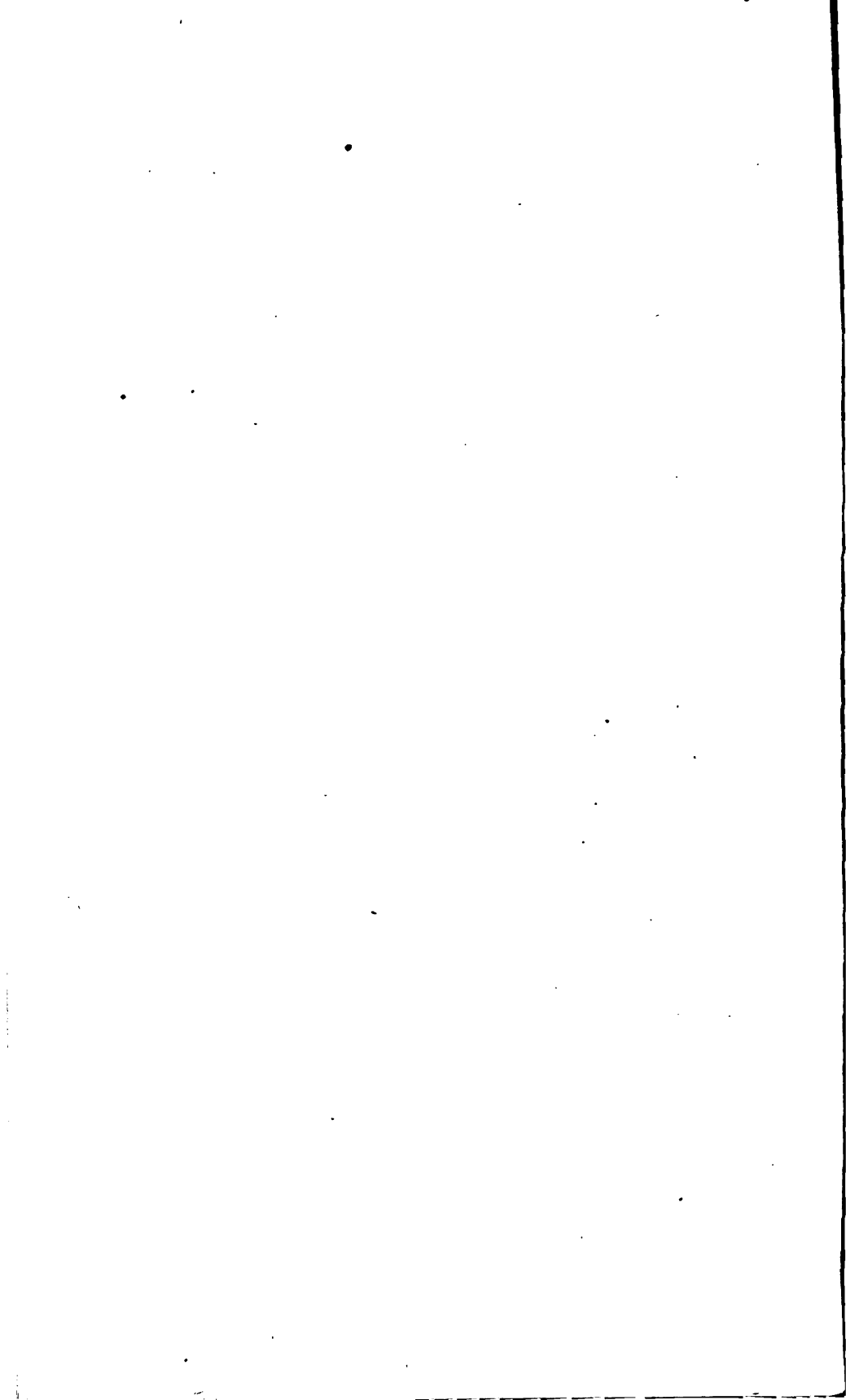
Methods of Operation

- 1. Street Construction and Betterment**
- 2. Street Resurfacing and Patching**
- 3. Street Sprinkling**
- 4. Street Openings**
- 5. Street Cleaning**
- 6. Street Lighting and Signs**
- 7. Street Car Tracks**
- 8. Sidewalks, Curbing and Crosswalks**
- 9. Sewers and Drains**
- 10. Collection of Refuse**

Costs and Purchasing

Labor

Recommendations

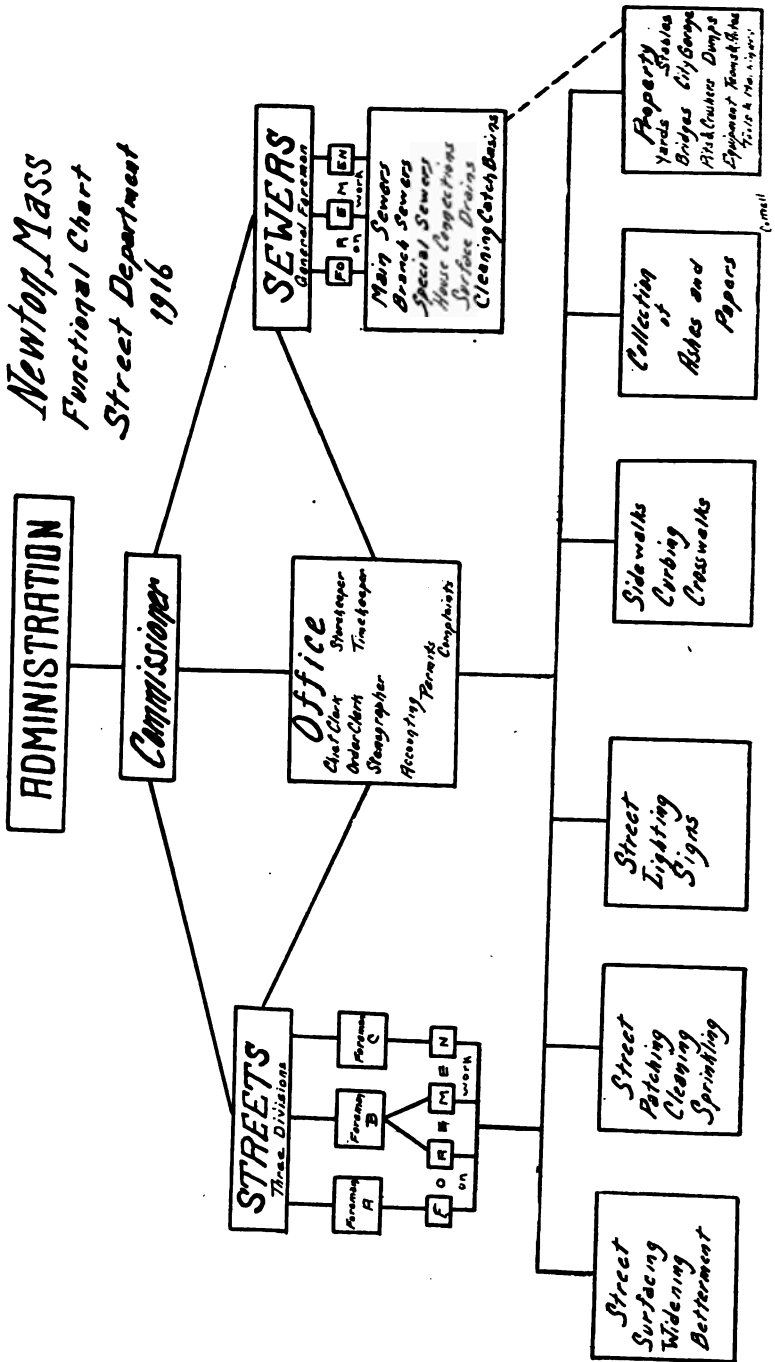


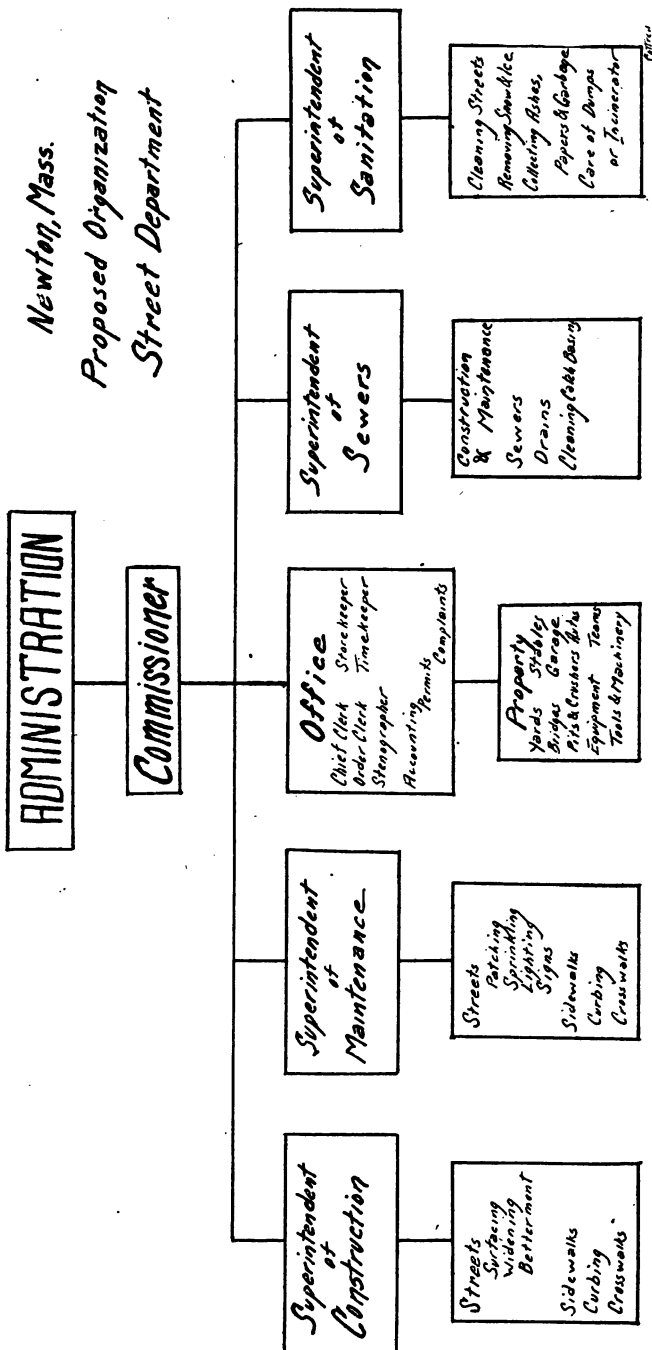
ORGANIZATION AND JURISDICTION

This department consists of a commissioner, three division foremen of streets, a sewer foreman, four work foremen for streets and three for sewers, three office clerks, storekeeper, timekeeper and a maximum of about two hundred and seventy-six laborers. The organization seems properly balanced and does not present an excessive number of executives for the work to be done. The mental division is 8.9% of the total and includes all mentioned above except the laborers.

The city charter provides that this department shall have charge of the construction, alteration, repair, maintenance, care and management of public ways, sidewalks and bridges, and the lighting and watering thereof; and the public sewers and drains. Other functions are shown by the organization chart following. Many of the functions usually found in this department are very wisely embodied in a separate Engineer department and are found in Chapter X of the Revised Ordinances.

The activities of the street department are usually regarded the most important of municipal activities and a community is judged by its streets and sidewalks. The commissioner is appointed for an indefinite term and brings with him thirty-seven years of experience in this department. His division foreman have all been in the department for twenty-five years and present a force which should give admirable supervision of the work. It cannot be said that the department is operated by amateurs although the charge of antiquated methods of operation might prove in certain cases. An actual service requirement for advancement to important supervisory positions is always desirable. Every effort is made by the commissioner so to conduct the affairs of the department that citizens would have slight cause for complaint either as to workmanship or expenditures. Complaints are usually the index of efficiency and few are recorded against this department. I believe too





prompt attention is paid to complaints received. This method is pleasing to the citizen but costly to the city. These complaints might be minimized by a proper method of inspection and the commissioner relieved of many unnecessary details.

A proposed scheme of reorganization of the department is made and shown in the accompanying chart. This proposal does not necessarily imply a lack of efficiency but a possible opportunity for further improvement. It would give the title of Superintendent to each of the existing division foremen and place one man over construction, maintenance, sanitation and sewers respectively. The functions of each are noted on the chart. There is only one drawback to this plan. The superintendent of construction would not have a very heavy task during the winter months. He might, however, be given the supervision of the construction of new equipment, signs, etc., and repairs of buildings, equipment, yards, quarries, etc. I believe this simplification of work would tend to a more thorough specialization of effort and a consequent increase in the returns of each function.

I would also recommend that a more thorough inspection system be inaugurated. Inspection and prompt reporting of defects will save much in maintenance cost which is already very high. This system would supplement the police inspection and constitute a regular patrol system to cover all jobs under construction or repair, report work necessary, defective conditions of streets, sidewalks, sewers or catch basins, improper filling of street openings, cleaning methods, improper use of permits issued, improper methods of refuse collection, defective lights and checking the quantity and quality of all materials and supplies delivered to the department. This would furnish live information to the commissioner and could be checked by the reports of the superintendents and storekeeper. It would present a definite plan of repair work and prevent haphazard assignments of labor and constant diminishing of the regular work crews.

OFFICE

The office of this department is well located, easily accessible to the public and department employees, has privacy for the department head, sufficient space, adequate arrangement of files, books, maps, office furniture and is near that of the Engineer where a safe is provided for filing maps and other engineering data.

The office force is adequate and highly efficient and its operation all that can be desired. The forms employed are numerous and cover cost accounting, issue of permits, contracts and specifications, sending bills, receiving complaints and recording the history of work performed. The forms include the uniform payroll, requisition blanks, Civil Service and Industrial Accident blanks; foreman's daily report showing price per day, labor, teams, equipment, materials and supplies, materials from pits and crushers, materials from outside, materials returned, special streets and signature; filing cards for job number (No. 1), street repairs date (No. 3), cost card for labor, teams, roller and equipment (No. 4), cost card for materials (No. 5), (See next two pages for detail and suggestions for a progress card (No. 2) and recapitulation card (No. 6); supply yard requisitions; daily report to Comptroller of stock received showing quantity, unit, description, price, amount and remarks; petition and application forms for sidewalks, lights, sewer and drains; police department blanks for defective lights; notices to inspect plumbing; statement to Board of Assessors of house connection charges; bills for house connections, sidewalks, etc.; transfer bill; schedule of bills receivable; permits to open, occupy or obstruct streets signed by the commissioner and the Mayor and checked by a police officer; permit to obstruct or encumber street; bond blank for properly restoring street to satisfactory condition; specifications and bids for sidewalks, road oils, curbing, forage, etc.; and a book for complaints. The new forms suggested are necessary for proper administrative purposes. The progress card is for the use of the commissioner in checking the time allowed for particular portions of the work. The

**FORMS FOR COST ACCOUNTING AND OPERATION
IN STREET DEPARTMENT.**

3 x 5

No. 1

CITY OF NEWTON	
STREET DEPARTMENT	
Work done on.....	Street
is to be known as New.....	
	Job No.....
Use this number on all records	
	Street Commissioner

3 x 5

No. 2

STREET.....		DIVISION.....		APPROPRIATION.....	
Nature of work	Begun	Completed	Source of Materials		
Grading			Pipe		
Sewer			Curbing		
Laterals			Sidewalk		
Drains			Stone		
Gas			Binder		
Electricity					
Water					
Telephone					
Railway tracks					
Poles					
Curbing					
Borders					
Sidewalks					
Sub-grade					
Base course					
Binder course					
Surface course					
Sand surface					

3 x 5

No. 3

STREET..... (Shows date when work was done)							
Repairs Drains	Patching	Street Signs	Repairs Plank Walks	Repairs Gravel Walks	Repairs Borders	Repairs Gran. or Con.	Repairs Curbing

FORMS FOR COST ACCOUNTING AND OPERATION IN STREET DEPARTMENT.—Concluded.

5 x 8

No. 4

STREET DEPARTMENT.....											APPROPRIATION.....		
Week ending....., 1916													
LABOR											EQUIPMENT		
	S	M	T	W	T	F	S	Tot.	Rate	Amt.	S.	D.	Amt.
									2.25				
									2.50				
									2.75				
Roller													

(Four sections of this
on each card)

5 x 8

No. 5

STREET DEPARTMENT.....											APPROPRIATION.....				
Date..... MATERIALS USED CLASSIFICATION.....															
Crushed Stone	Sand	Screened Sand	Gravel	Rubble	Loam	Sods	Bounds	Street Sign Posts	Fence Posts	Gasoline	Kerosene	Lumber	Nails	Paint	Oil Mixture

3 x 5

No. 6

RECAPITULATION OF COSTS			
STREET.....		DIVISION.....	
APPROPRIATION.....			
Begun	Estimated Cost	Total	
Completed	Final Cost	Total	
Materials	Estimated Cost	Sq. Yd.	
Labor	Final Cost	Sq. Yd.	
Equipment			
Overhead			
Total			
Length			
Square Yards			

recapitulation card is to be filled out by the comptroller and filed in the department office to check the estimate and final cost of all work.

Permits should be issued and fees charged for all street and sidewalk obstructions such as signs, poles, awnings, vaults, etc.

The system of accounts for this department is carried in much detail and it is a very easy matter to determine the costs of practically all the functions, sub-functions and smaller divisions. The practice of buying in a supply account for the three departments is an excellent one and a sure means of economy. It allows for a more flexible system of purchasing than is possible under separate department purchases which were made at the time the money was available and at the time the materials and supplies were needed, and when prices might be unfavorable. It also makes for a more just distribution of charges to the particular jobs.

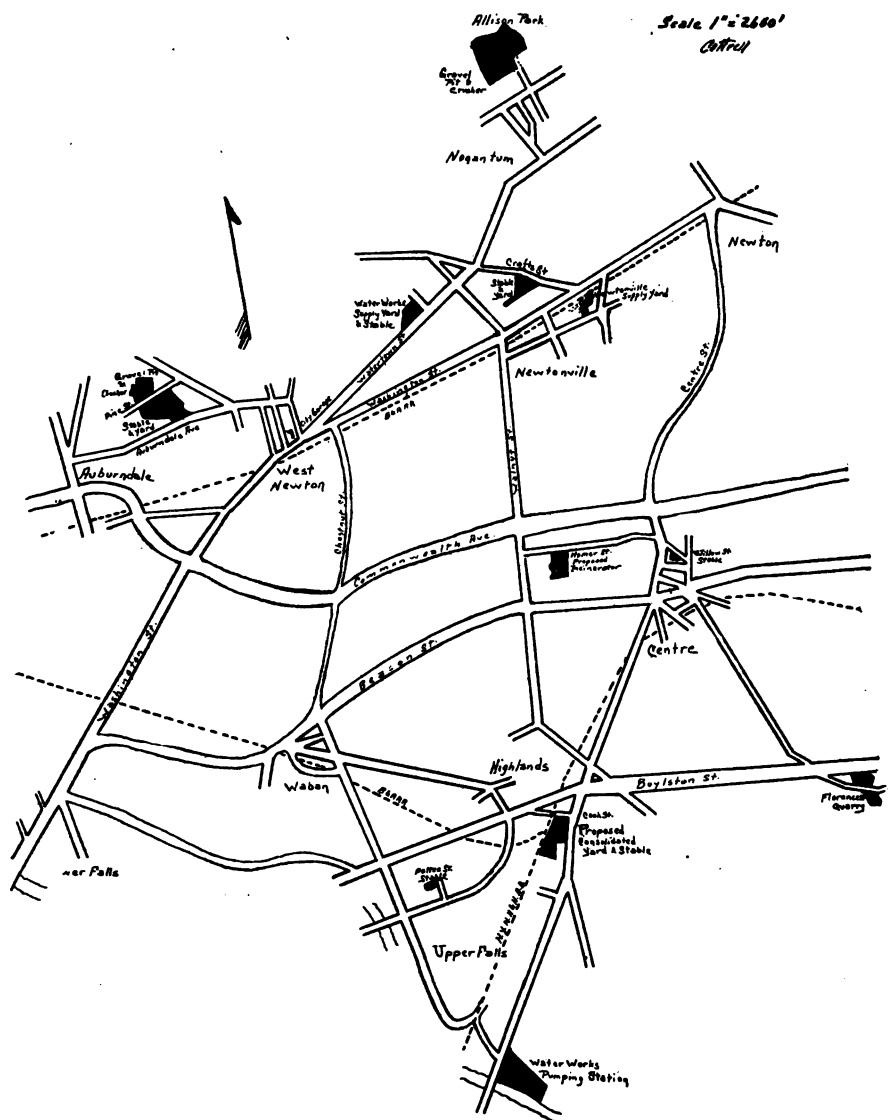
STABLES, YARDS AND EQUIPMENT

The locations of the stables and yards of this department are shown in the accompanying diagram. The Auburndale Avenue and Crafts Street stables and yards are large in area and have sufficient room for future development. The Willow Street and Pettee Street stables are entirely inadequate for present uses. The Willow Street stable is a fire menace as well as being in danger of collapse. The photographs show the proximity of this danger to the fire department central headquarters and suggest the possibilities of a destruction of the heart of the fire signal system of the city.

The sheds of all the yards are not sufficient for the storage of the equipment of the department and much of it is stored in the open air and subject to rapid deterioration.

The stables are clean and well kept, the supply of forage is adequate and of excellent quality and there does not appear to be any waste in feeding. The horses are in the best of condition and show the results of excellent care. There is a machine shop, paint shop, wheelwright and blacksmith shops

*Newton, Mass.
Sketch Showing Location of the
Stables, Yards & Quarries*



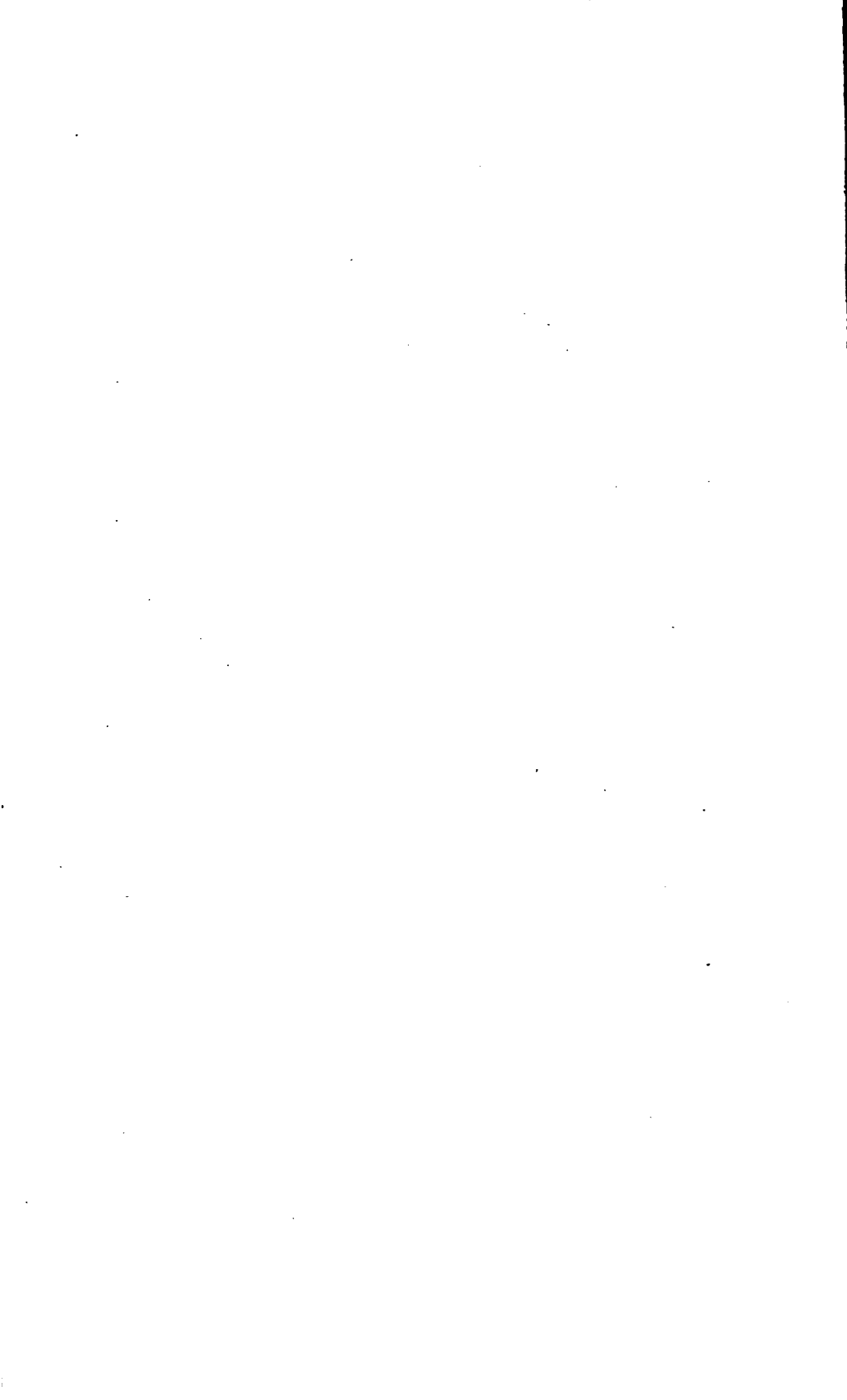
at the Crafts Street stable and all repairs, painting and construction of tools and equipment, and shoeing of horses is done here with a very large saving to the department.

The storage for all sewer materials and for the small supplies of the department is in the Newtonville freight yard. An annual rental of \$350 is paid for this space by the Street and Forestry departments who use it jointly. The storage space in the storehouse is not large enough for both departments together. The stock rooms are overcrowded and the machine shop is used for a garage at night by the Forestry department truck and foreman's runabout. Much of the property of the Forestry department is scattered around in the open and should be better protected. The yard is not large enough for the proper storage of all of the lumber, coal, pipe, brick, cement, castings, flushing tools and ropes, tool boxes and other equipment and materials of the Street department, to say nothing of having the trucks, several sprayers, many barrels of creosote and other apparatus and supplies of the Forestry department. Many of the tools are rusting in the open air and need proper sheds for protection.

The system of bookkeeping and checking of supplies is adequate except as mentioned under the section on "Accounting." The storekeeper has record of all stock and tools received and issued, copies of all requisitions, and makes a report to the Comptroller daily. He takes an inventory in December of each year which I believe should be made fluid and reported currently to the Comptroller.

The city now owns a lot on Winchester and Cook streets which contains 80,650 square feet and has the service of both the Boston and Albany and New York, New Haven and Hartford railroads. This lot is twice the size of the Newtonville yard and presents possibilities of large saving in the storage and hauling of materials. I recommend that the Forestry department be moved to the Crafts street yard and given a building for its needs on the north side of this yard; that the Newtonville supply yard and the Willow and Pettee streets stables be abolished and that a stable and supply storehouse be con-

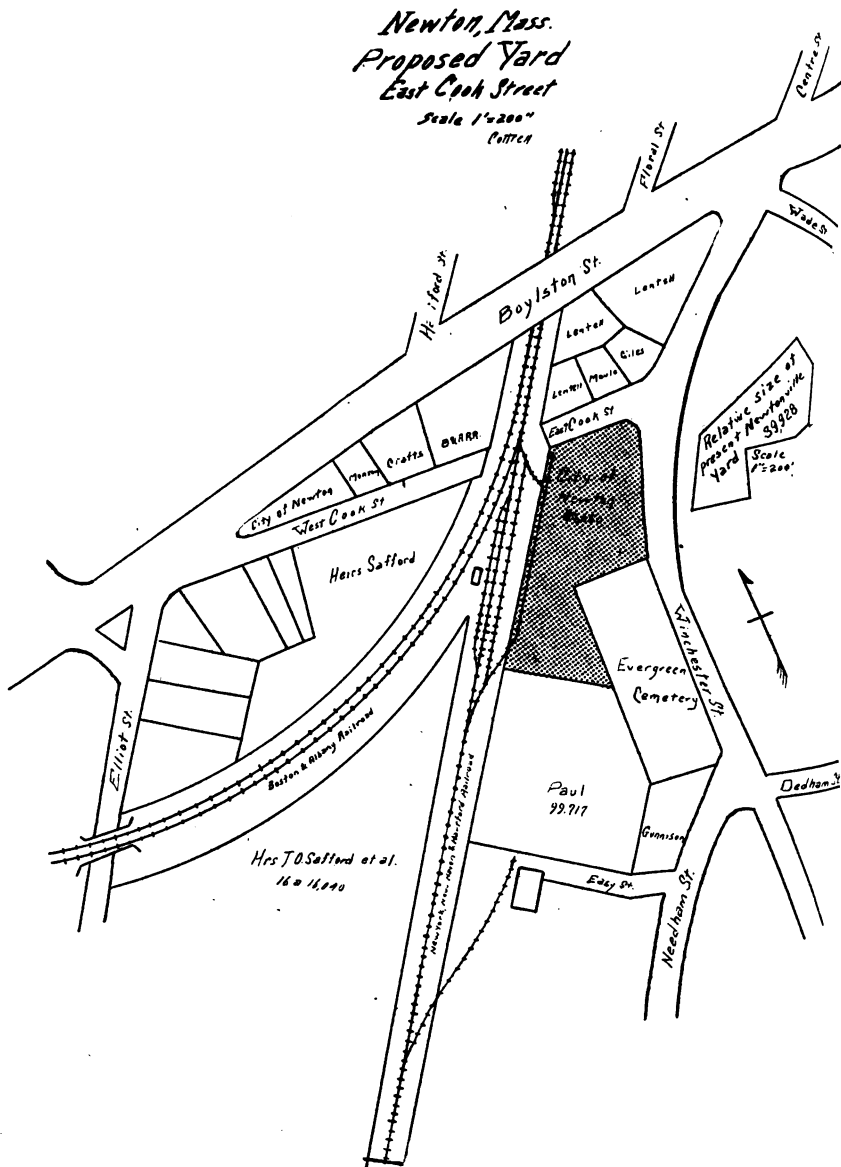




structed at Cook street which would offer more facilities than are found at present in these locations.

The city should purchase the Paul land just south of this proposed yard and add this 99,717 square feet for storage purposes. The topography of this lot lends itself to the proper development of storage facilities. It is a very level area for 90 percent of its surface and has room for an additional spur track. Its southwest corner adjoining the railroad is elevated from ten to fifteen feet and is an ideal location for storage bins for crushed stone or coal and tanks for road oils. This elevation gives the possibility of loading teams and tanks by gravity and saves the great cost of double handling and cartage of stone and the pumping of oils. These bins and tanks would also save demurrage charges which are usually heavy. Two storage tanks with capacity of 10,000 gallons each and costing under \$2000, and at least three bins with capacities of 100 tons each should be erected. Concrete structures could be designed and built by the department in slack seasons when the weather was not too severe and at considerable saving over contract work.

The advantages of this location are many. There will be extensive new development in Waban, Highlands, Thompsonville and Chestnut Hill districts in the next few years. There are two railroads and ample spur track facilities and the charges are very little more on one and less on the other than those for the Newtonville yard. There is a large area for expansion and adequate space for storage of materials of all three of these departments. It is near the available quarry lands which might be developed. It has easier gradients to all parts of the city and is more accessible in distance than the present yards. It has the natural features for location of storage tanks and bins and the city might purchase all of its coal, stone and oil at the low price seasons and store them here until needed for use. The one disadvantage is that 80 to 85 percent of the laborers reside in the Nonantum district and provision would have to be made at Crafts street for their transportation to the location of their work.



The present equipment of this department is in fairly good condition but rapidly deteriorating. Practically all of it needs painting and numbering and some conspicuous and distinguishing colors should be used. The necessity of exposing much of it to the elements is a factor which should be taken into consideration in the cost of maintenance and depreciation should be written off each year. This could be overcome by the adoption of more modern equipment or better storage space. Iron bodies with mechanical lifting and dumping devices might be purchased gradually to replace the easily broken wooden bodies. These wagons supplied with automatic features reduce the operating cost over fifty percent. They are practically useful in the collection of refuse and can be operated by one man instead of two or three now necessary to do the lifting for each cart.

Experience of large contractors and other private firms has shown that the motor driven apparatus is a great saver over horse drawn vehicles. This saving amounts to at least fifty percent and is reflected in both maintenance and labor savings. The cost of upkeep is always in favor of the motor as against the horse. Experiments made with the steam truck while it was being tested in Newton showed that it would do the work of five double teams at least. Time tests made on the hauling of stone from Allison pit to Suffolk Road and from the Rowe Brothers quarry in Allston, show that this truck with trailer could carry fifteen tons on one trip and make about four trips per day on an average of about fifty miles per day and deliver sixty tons of stone. A double team would take one and one-half hours to deliver two tons four miles and be exhausted. This would mean eight double teams to deliver one load of the truck and trailer and only two trips a day could be made by the horses. The steam truck is not as effective as the motor driven truck for all-around work. It is slower, consumes about 100 pounds of coal per ten miles and is more economical on tire expense but harder on the highways. The motor truck is more adaptable to other work, makes more trips per day, gets from four to five miles per gallon of gasoline and is more easily

operated. The cost of operating the gasoline 10 ton truck is about five cents per ton mile, the 5 ton truck about seven to ten cents per ton mile, and the 2 ton truck from fourteen to twenty cents per ton mile. The cost of double teams is usually about twenty-five cents per ton mile. All of these figures are exclusive of labor for loading and operation which would further increase the advantage of the motor apparatus.

I recommend that the department be supplied with one large truck for hauling stone and other heavy work, with one small truck like its Sewer division truck for the purpose of transporting labor and materials to distant parts of the city. This truck should be supplied with a removable body and provision made to mount an oil spreader for penetration and sprinkling work. This feature would save the \$1500 a year now paid for tank rental. A second feature of value would be a body for the automatic spreading of sand on the tarvia surfaces and icy streets in winter. The savings in time of labor transportation, cost of oil spreading and hand spreading of sand would soon cover the cost of this truck and its supplementary bodies.

Three other suggestions might be made for motor driven apparatus. The use of a motor sweeper would reduce the cost of cleaning the streets about fifty percent and give a far better result than the present hand patrol system. It could do all the main streets of the city twice a week and thus reduce the number of hand sweepers to at least one-quarter of the present force.

The use of a tractor and trailers in the collection of ashes and rubbish would save large sums of money and speed up the collection. The tractor would be in motion all the time and the teams would be loaded with the automatic apparatus operated by one man and drawn by horses to the point of collection. Each tractor could handle at least two teams or one large paper wagon and make the trip more rapidly than the horses. A third use of the motor truck is in the removal of snow from streets. Horses are necessary for the removal of snow from the sidewalks but the use of a plow attached to the front or rear of a motor truck will clear away large amounts of snow in a very short space of time.

The foreman of division C should be supplied with a Ford runabout. He has the largest area to cover and finds difficulty in covering it with a horse and wagon.

The department is well supplied with other necessary equipment. It has five rollers (but could use two more), a concrete mixer, an air compressor drill, tar heaters and sprinklers, four stone crushers, road scrappers and much other equipment listed in the annual report of the commissioner. Most of this is of recent date and is in fairly good condition.

PITS AND CRUSHERS

This department has operated crushers at Pine street, Allison Park and Florence street. The Pine street supply is practically exhausted and a small amount is available by purchase of a strip of land for about \$1500. This land would furnish gravel for about one year at the present rate of use of this pit and it would be advisable to make the purchase. The Allison pit is exhausted and operations have ceased and the crusher been removed. The Florence street quarry is not solid material and there is much waste in stripping and drilling. The cost of operation of the quarry is approximately \$3.00 per ton at the quarry. There are no bins for storage and the cost of re-handling the material is excessive. If the stone is to be used immediately in the near vicinity of the quarry it might be reasonable to operate it. Stone can be purchased from \$1.25 to \$2.00 a ton delivered on the work and if the supply is furnished when needed is the best method of operation. The estimate for this year was made on the \$3.00 per ton basis and it has been bought in the open market and on contract for \$1.50 which will leave some \$3000 to be credited to the supply account.

Newton has two good crushers which can be operated by electric power. The employment of skilled engineers, firemen and operators is necessary at present but much of their time is wasted by the slow delivery of material to be fed to the crusher. On one occasion it took six men forty-three minutes

to shovel one small dump cart load of gravel. An electric driven crusher would eliminate the engineer and fireman and should crush at least 100 tons of stone per day if properly supplied with material by means of air drills and steel cars on rails.

The addition of these features would reduce the cost of operation to about seventy-five cents per ton. This system is only economical on a large and solid ledge and where a large amount of work is to be done. Newton is warranted in doing its own crushing only if:—

1. Stone is not available in the market at low prices,
2. Quantities are not delivered to suit the speed of the work,
3. Purchase of good quarry property is possible,
4. Proper methods are used in operation.

At present stone is available at reasonable prices, quantities may be delivered to suit speed of work, no quarry land is available and modern methods are not employed.

CITY GARAGE

The care and operation of the city garage has been placed under this department and the cost of operation is recorded under salaries, care of building and supplies. The garage is conveniently located to the City Hall and has space for fourteen cars on the lower level and the police patrol on the upper or street level. All cars are kept here except the large trucks, runabout of the foreman of the Forestry department, Water department repair runabout and car of the Chief of Police. An attendant is on hand from six to ten in the morning and one to six in the afternoon and makes all general repairs and furnishes all supplies. These supplies are purchased in the open market at very favorable prices and carried in the supply account of the department. A monthly and annual record is kept of each car showing in detail supplies, repairs and odometer reading. Reports are made to prevent the free use and abuse of the cars. The head of each department is expected to report to the Comptroller the daily use of his cars showing mileage, destination,

object of use and expense incurred. This system requires the cars to be used only for official business and prevents the use on Sundays and holidays except by permission of the Mayor for special business. It also allows the Comptroller to find the unit cost of operation for gasoline, tires, oil, repairs, etc., and make comparisons between similar cars similarly used. All cars are marked in a conspicuous manner and except for the fact that complete reports of their use are not made as required, there appears to be no great abuse in their use.

The policy of trading-in all cars which have exceeded a mileage of 10,000 is a good one and better results are obtained by this practice as constant repair and maintenance charges increase above this mileage.

METHODS OF OPERATION

1. CONSTRUCTION AND BETTERMENT

Several facts are obvious concerning the 224 miles of macadam street of Newton. They carry an enormous amount of traffic, have adequate width and length, and are in better condition than those of any other city in this section of the country. It is no exaggeration to say that Newton is getting more and better street surface and at a lower cost than any of the cities with which comparisons can be made. The diagram showing the radial thoroughfares will emphasize more than words the necessity for constant construction and maintenance of the streets, and explain the amounts of annual expenditure for these purposes. Commonwealth avenue carries a heavier volume of traffic than any street outside of the business section of the large cities and the Metropolitan and Boston park areas. Washington and Beacon streets carry an enormous amount of truck traffic going from Boston to the outlying towns. The cross streets are of no less importance and emphasize the situation of Newton between Boston and its populous suburbs.

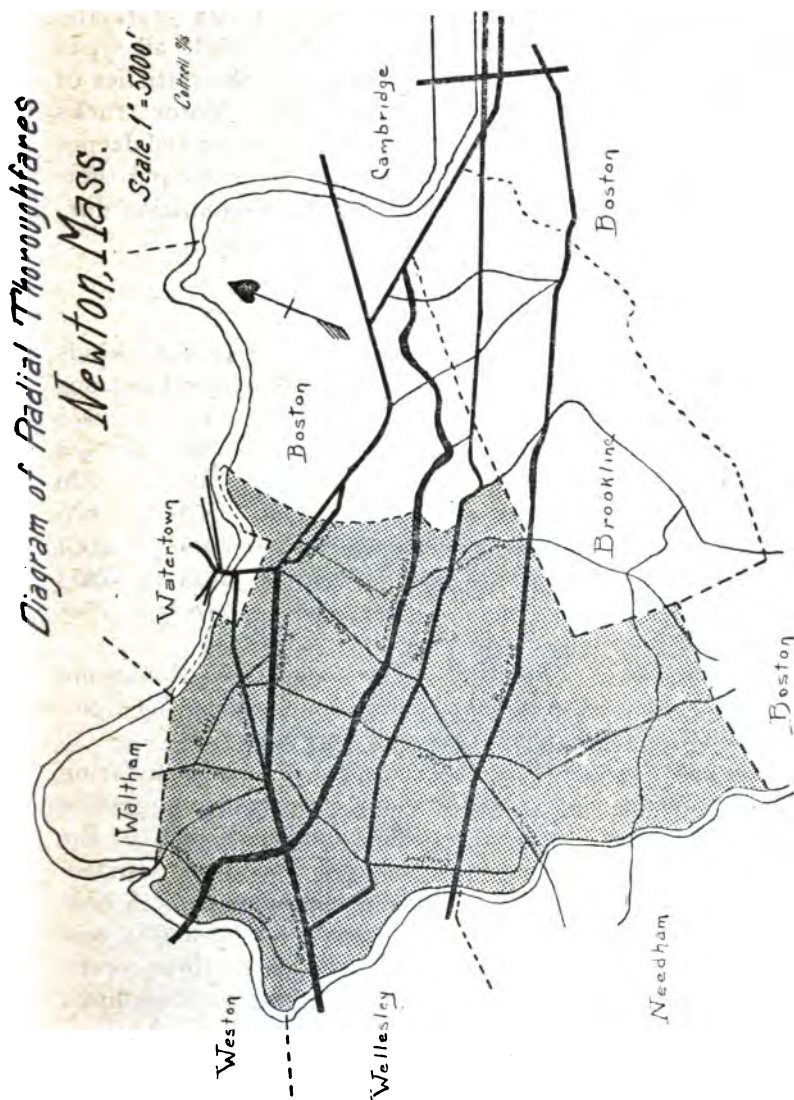
Automobiles have increased over 420% in six years and horse drawn vehicles have decreased 30% while all types of traffic have increased 145% according to the statistics of the Massachusetts Highway Commission. Motor trucks comprise 6% of the traffic and require a stronger and deeper foundation and more expensive surface to withstand their weight and speed. A study made by this Commission during the week of August 23d, 1915 shows:—

Daily Averages.

	Horse Percentage	Auto	Auto All kinds Ave. all stations	
Division 1, Western Mass.	19	81	383	475
Division 2, Central Mass.	24	76	360	473
Division 3, Eastern Mass.	16	84	602	720
Division 4, Cape district	16	84	566	676
Metropolitan Parks	4	96	2549	2664
Boston Parks	14	86	2445	2853
Newton	17	83	2120	2548

The stations located in Newton were at Nonantum Square, Commonwealth avenue and Centre street, and Commonwealth avenue and Washington street.

The determination of street construction and surfacing lies in the Board of Aldermen acting upon the suggestion of the Street commissioner or the petition of 75% of the property owners on the street. Repairs and minor surfacing lie within the jurisdiction of the commissioner. A definite policy of resurfacing has been worked out and is now nearing its completion after an operation of three years. All the main streets have been placed in first class condition and the circumferential streets are receiving attention. Future plans must include the study of the increase in the amount of traffic and its speed and weight and determine between the present penetration macadam and permanent pavements. This balance between long-lived surfaces with low maintenance costs and lower-cost road surfaces with



constant repair is an important one. This increasing traffic factor has brought great advances in road-making and the treatment of highway problems, and is taking them out of the realm of amateurs and placing them in the hands of the highway engineer. In the last few years we have abandoned the use of water-bound macadam and substituted a bituminous method at an increase of from 25c to \$1.00 per square yard. Many cities have plunged into the long distant bonding of so-called permanent pavements and are now replacing these pavements and still paying off the old bonds.

The system of tar penetration with a properly drained telford base being used in Newton is withstanding the hardest tests and I believe will last for many years. The failure of the macadam surface always comes in the poorly prepared base or in the skimping of materials in the binder course. Roadbuilding is commonplace work and the good results are seldom mentioned but always appreciated by the amount of traffic which a good road draws to itself. Bad conditions attract attention and much comment. The commissioner must have much experience and skill and a conscientious body of supervisors to attain the best results. A street once built must be durable, smooth, noiseless, clean, not too slippery for either automobiles or horses and of low first cost. The tar penetration method answers all of these requirements and ranks at 80% in the list of acceptable street surfaces being exceeded only by the bituminous concrete as an ideal pavement.

In the construction of new streets I find that the department is using great care in the sub-grading and laying of the foundation with proper size and strong stone. The stone is properly placed to prevent the subsoil pushing up or the penetration coat leaking down through. The wearing course is always of clean stone or proper size, uniformly placed and properly rolled and the binder material applied under pressure either by tank spreader or hand spreader. About two gallons per square yard is applied and is properly uniform. The top or seal coat consists of stone chips

or small gravel and is covered with about one-half gallon per square yard of binder, sanded and rolled to the proper smoothness. This makes a durable, attractive and waterproof surface and if properly constructed will not bleed or roll except on the hottest days and on the down traffic side of the steep hills.

It is almost impossible to give an approximate cost of construction. This depends entirely on the traffic carried, the width of the road, the depth and amount of subgrading, the quality of the materials used, the condition of the labor market and the length of haul of the materials, and varies with each location.

One point to be mentioned in the construction of new streets is the jurisdiction over the location of poles. This power is vested in the Board of Aldermen but the moving or renewal of poles does not need the sanction of the Board. On August 8th the Street commissioner notified the Edison company with others interested by letter and telephone to move five poles on River street to provide for widening. One pole was set immediately and the others placed at the side of the street. On the 18th of September two poles were removed and two still remained in their original position on the 30th of the month but the wires and cables were being transferred. In the meantime one-half of the street surface and the sidewalks had been completed and it would be necessary to bring the tools and roller back to this location to complete the work. The power to order pole relocations of this sort should be vested in the Street commissioner and Wire inspector with the approval of the Mayor and not have to wait all work for the meeting of the Board of Aldermen after a summer vacation.

2. RESURFACING AND PATCHING

Maintenance begins the moment construction ceases. Loose stones, shoulders, manhole covers or car tracks disintegrate the surface and require instant treatment to

prevent crumbling. Constant care and a vigilant patrol must be maintained to mend the pavements immediately. A separate system of inspection with tools and materials for use in repairs should be on the roads during the entire year. There is always enough work to keep an inspection gang busy and these repairs can be made when the defect first appears and not wait for the whole series of holes sure to follow. All heavy traffic streets should be "painted" at least twice a year, once when the frost is out of the ground and once in the early fall. This "paint" coat prevents ravelling and renews the binder coat which has been bearing the wear of the traffic thus preventing the movement of stone in the body of the road. It prevents the formation of mud and preserves the waterproof condition of the road. This service usually costs less than 5c per square yard for labor and material and is nearer 2c for roads kept under constant care and supervision.

The method of resurfacing the roads has been described under construction and consists of either picking up and rolling the old surface with a fresh tar top or of building an entire new top. The latter method is employed in Newton and gives the best results, as the stone must be clean to give the proper binding surfaces.

It is almost impossible to estimate the amount of money necessary to be appropriated for resurfacing and repairs. The conditions of last winter with its late covering of snow preserved the roads from wear and less repairing was necessary than estimated. The estimate of 65c per square yard for resurfacing was ample and at this writing the department has nearly completed its work plan and has almost one-third of its appropriation unexpended.

I have examined the streets built or resurfaced during the last three years and find all of them in excellent condition. The streets resurfaced in 1914 were done at an actual cost of 55.4c per square yard average, those in 1915 at an average cost of 62c per square yard and those in 1916, with an increased cost of oils of 15% and labor of 10% will

average well under the 65c estimated. I have watched all of the resurfacing that has been done this year and compared it with that being done in other cities and find the methods employed and results obtained in Newton superior to those in other cities. The only streets to compare with those of Newton are Mount Auburn and Galen streets in Watertown laid with Bermudez asphalt binder, and Buckminster Road in Brookline. The only criticism which can be made of the streets resurfaced in past years is the rolling on the down-traffic sides of the hills on Commonwealth avenue, Beacon and Boylston streets. This condition is almost impossible to prevent as the surface on any grade of over 5% will tend to creep. The surfaces on the steeper 10% grades off Washington street are in remarkably good condition because there is less heavy traffic on these cross streets.

Only two criticisms can be made of the method of construction. These are the slow delivery of the stone purchased on contract and the assignment of laborers to other jobs. I believe that with the prompt delivery of stone and no interference for collection of ashes or repair work many of the surfaces could have been laid at \$1000 less than expended. This is particularly true of High and Elliot streets where the combined cost was within \$163 of the estimate and the saving could have been ten times as much.

Streets which are in need of new surfaces are California from Nevada to Dalby, Nonantum, Pearl from Watertown to Jewett, South, Homer from Commonwealth to Walnut, Beacon just west of Hammond, at Hobart Road and between Sumner and Centre, Washington from Wales to the Charles River, Arlington, Park from Sargent to Kendrick Park, Woodward from its new surface to Chestnut, Chestnut from Boylston to Mechanic, Crafts from the new surface to Washington, and Grove from the new surface to Hancock. Most of these have been mentioned by the Commissioner and are causing an enormous outlay for patching and filling of holes.

One practice which calls for special mention was observed on Grove street during the second week in July. Five men and a double team spent three days in edging about one-half mile of grass on both sides of the road, digging several run-offs and weeding the sidewalks in front of the only two houses on this part of the street. The work was unnecessary at the time and two months later was done over again more thoroughly when the street was widened and surfaced.

Another practice which calls for mention is the lax manner in which the tools are allowed to remain scattered about the work. This has been noted in street construction in several localities, in sprinkling work during the rainy weather in June and at the gravel pits. I am told that none disappear but it is taking a long chance with human nature and offering a temptation which is unnecessary.

The costs of resurfacing of the last three years ranging from 55 to 65c per square yard are well below those found in other cities. Here again it is almost impossible to compare these costs as the thickness of stone, amount of binder, length of haul, and other factors vary with each job as well as with each city. A cost of 35c per square is estimated for the simple filling of holes and prevention of shoulders ravelling but what does this mean when you can never measure the depth of the hole, the size of the break or the amount of material and labor used in each repair?

The State Highway Commission is paying 99c to \$1.13 per square yard for 6 inch surface and a two gallon per square yard grout and from 54 to 87c for 4-4½ inch surface. The average for many cities and states varies from 72 to 85c per square yard for the four inch road exclusive of the telford base and using the two gallon binder. Cambridge pays 69c, Somerville \$1.20, Lynn 65c, Haverhill 67c to \$1.10, Watertown \$1.00, Norwood \$1.05 and Salem 80c. Some of these cities are using asphalt or Topeka mixture which might increase the price given.

3. SPRINKLING

The watering of streets which was once an important function of this department is now a thing of the past. Light oils and tar dressings have now displaced water and act as a preservative of the surface as well as a layer of dust. At least two applications of oil should be made each year on every street and I believe if the assessment method is to be used that the citizens will appreciate its benefits much more than they were expected to do under the old system.

4. STREET OPENINGS

All street openings (except by the Water department) are made upon the issue of a permit and with the approval of the Mayor. The general practice is to prohibit these openings until at least two years after the street surface is completed. A security is required for restoring the street to its original condition and keeping it in condition for six months thereafter.

The general ripping up of streets is one of the worst offenders against good street surfaces and brings the most constant need of repair. Openings are seldom backfilled properly and the street surfaces can never be made as good as the original. The street department has restored practically all of the recent openings to a creditable condition but in every instance there is either a depression or hump which tends to throw the wheels of rapidly moving vehicles and cause another depression on either side which sooner or later disintegrates and causes a need for further repair. I mention two examples of recent openings. One on Waltham street was in bad condition for over a week, while that on Elm street was one of two excavations made in the new surface within three days after its completion.

In this connection I would recommend that all sewer and

water pipes or other house connections be laid in one trench and save at least 25 per cent of the cost of installation. I would also suggest that all house connections be laid when new street surfaces are being constructed. These connections can be run to the property line and connected when the development of that street calls for their use.

5. STREET CLEANING

This department is responsible for the cleaning of streets, collection of ashes and refuse and the removal of ice and snow.

The cleaning of streets is one of the most important health problems of the city and is very poorly performed. The main streets, except at important squares and intersections, are far from clean and many of the side streets are unsightly with all sorts of refuse. Many causes are found for this condition and can be seen by standing at any point on the main arteries of the city. Among them might be mentioned sand sprinkled on tarvia surfaces, abrasion of macadam surface, dirt carried on streets from alleys and lots, excrement of animals, decay of leaves, distribution of advertisements, ashes and rubbish from barrels and carts, sweepings from stores, building materials scattered from carts, grinding of materials by car wheels and automobiles, and inefficiency of the hand sweeping method.

The issue of permits for moving building materials and rubbish, distribution of advertising literature, vending in the street, building bonfires and sweeping of stores should go a long way in preventing this condition. All wagons carrying fine material should have tarpaulin covers to prevent the contents blowing about.

The patrol system of cleaning is used and each man is expected to cover 8,000 square yards in the squares and 35,000 square yards in the outlying streets each day. This system covers all the main arteries of the city and occasional visits to the secondary streets. The sweepings are collected by

teams in Newtonville, Nonantum and Newton districts but are disposed of in vacant lots in all other sections. The division foreman is responsible for the inspection of this work. The men are supplied with various types of collecting carts from the ordinary inadequate wheelbarrow requiring many trips to the dumping place, to the barrel cart which can be taken from the wheels and placed on the sidewalk for collection. I would recommend that all the sweepers be supplied with this last type of receptacle and that all material be collected where possible.

A motor sweeper for the main arteries would be advisable and reduce the cost of cleaning from 50 to 65 per cent per 1000 square yards. This sweeper would cover 150,000 square yards each day at a cost of about \$25 and figuring on about 150 days' operation in the year would amount to an annual cost of approximately \$15 per day and a per 1000 square yard cost of 20c. The present system is costing approximately 35c per 1000 square yards.

All main streets and sidewalks should be flushed at least once a month during the spring and summer. This method would carry off much of the fine dust which broom and machine sweeping does not reach and which is necessary to prevent discomfort of pedestrians.

The removal of snow and ice is a very important part of the work of this department. The citizens of Newton are fortunate in having this service performed by the city. The cleaning of sidewalks requires the work of about sixty horses and plows and covers some 300 miles. It is labor of an emergency nature and requires the instant service of horses and men. Enough horses would have to be retained by the department for this work or some source of available supply found. The laborers retained during the winter can be given work of other nature until the snow emergency arises. Provision should be made for transferring the men from other departments to this work.

The work which this department is called upon to do in the removal of snow from streets is increased by the prac-

tice of the street railroad plows throwing the snow from the track and leaving it for the city teams to remove. I have seen this practice on several occasions in the last three years but have not studied it sufficiently in Newton to suggest any definite remedy. The company is required to remove snow and ice from its tracks and from the space between the tracks and the sidewalk. Snow plowed into the streets must be removed to the satisfaction of the commissioner to make safe travel. My assumption would be that an agreement should be made between the city and the company for the mutual payment of costs of snow removal from the streets used by the company.

I have already suggested the purchase of a snow plow attachment for a motor truck. This truck and attachment can clean a space twelve feet wide at the rate of twelve miles an hour in an ordinary snowfall and would be of great service on the long main arteries.

6. LIGHTING AND SIGNS

This department has supervision of the location and maintenance of street lights and signs.

An inspection was made of the lights on all the main arteries of the city and a map prepared and checked up from the records of the department office. The photograph of this map on the following page shows the 162 arc lights in large black dots, the 1827 incandescent lights by smaller black dots (red on the map), and the 1067 gas lights by heavy black lines and dots. These lights are furnished by contract, the electric for ten years and the gas for three years. The total contract for electricity calls for 1989 lamps at a cost of \$42,662. The cost per capita is \$1.35 which is much above that of other cities and the cost per square mile is \$3253 which is much below most cities. These figures are accounted for by the large area lighted. With the great extent of the streets and abundance of trees the lights are much below the standard and in general it might





be said that Newton is poorly lighted except for the squares and the entire length of Washington street. The object of adequate street lighting is to get plenty of it at a small cost. Many of the lights were placed years ago before the young trees had grown, and uniform and full lights are not possible on most streets with the present conditions. The ideal system is to have every street well lighted for its particular use and uniform throughout its entire length. Streets differ and lamps should be placed to suit these differences. All lights should be brilliant and closely spaced to prevent shadows. They should give the maximum light at the street surface and not waste from 40 to 90 per cent of it in the trees as on Commonwealth avenue and Centre street. Spacing at important points is necessary and it is impossible to make any general rule to apply to all streets. New type lamps are giving more light at less expense and should be adopted where possible. Luminous arcs on low poles should be used on Commonwealth avenue to correct the waste which is there at present.

An example of good lighting is found on Washington street from Auburn to the Charles River. The lights are well spaced, hang over the curb line and offer no shadows between poles, being practically a continuous line of light.

Streets which need attention in the matter of spacing of lights or trimming of trees are Beacon through Waban, Waverley avenue, Hammond, Centre from Mill to Commonwealth avenue, Watertown through Nonantum and Walnut south of Commonwealth avenue.

Outages and defective lights are numerous and the police reported nearly six thousand during the past year. Eight arcs out of commission on Commonwealth avenue were counted on one night this summer. Deductions are made for these outages or defective candle power but the department does not make tests of the latter.

SIGNS.

The street signs are in general well placed and entirely

legible. These signs are made and painted by the department and are being placed where needed as rapidly as possible.

7. STREET CAR TRACKS

The street railroad company is required to pave its tracks and maintain the surface between and for eighteen inches on each side to the satisfaction of the Street commissioner. It must specify the type of rail to be used and change its grades when ordered.

The stone blocks laid in a loose condition are a menace to the street surface and are uneven, unsightly and increase the maintenance costs. At practically all the street and track intersections conditions of uneven blocks appear as shown in the photographs on the following page. The commissioner has the power to order the kind and quality of material for paving and should require all blocks laid on a concrete base and grouted with cement as has been done on Centre street. This method allows the street surface to approach the rail block teeth and not frazzle on the edges from the jar of the cars over the rail joints. This frazzled condition is best seen the entire length of the rails on Watertown street, in places on Walnut, Washington, Park, Tremont, Lexington, Centre and Adams streets and needs constant repair of the macadam at these points.

8. SIDEWALKS, CURBING AND CROSSWALKS

The tar concrete sidewalks, gutters and crosswalks are in excellent condition. The wooden walks are in a dangerous condition in many places and need a large amount of repair.

The tar concrete sidewalk is laid at an estimated price of 74c per square yard of which the city pays half and the property owner half. This is a reasonable price and is below the general average of 80c. Some cities pay much less





than this price but are laying a thinner walk and not getting the same results. The maintenance costs are figured at 2c per square for about 3 per cent of the total area repaired each year. There are about 33,000 linear feet or 11,000 square yards of plank walks in the city laid at 80c per square yard, and maintained at an estimated cost of 14c per square yard. These walks cost more to construct and seven times as much to maintain and are dangerous to pedestrians. There is absolutely no justification for their construction on settled streets. No more plank walks should be constructed and those in existence should be replaced gradually by the tar concrete or granolithic walks.

The city is paying 86c per linear foot for dressed curved curbing, 70c for straight and \$2.35 each for corners. These prices are above those paid in other cities which run from 39 to 65c for straight and 60 to 75c for curved.

9. SEWERS AND DRAINS

A summary of the important facts regarding the sewerage system is found in the annual report of the Engineer. I would recommend that these statistics be published under the Sewer division of the Street department report where they would be of more value as reference. I also recommend that this department be charged \$600 per year for the labor and power for the operation of the sewage pump at the Upper Falls.

Sewers are constructed upon petition to the Street commissioner and the city pays half of the cost of mains and the abutter for all connections. These charges are a lien on the property and are paid on bills sent out by the department through the Assessors to the Collector. The proportion of assessment is only 36.7 per cent of the total and is rated at 20c per foot frontage and 1c per square foot area not exceeding 125 feet deep. This is based on an estimated average cost of \$3.64 per linear foot for mains and 82c per foot for connections.

The cost of laying sewers per linear foot varies from \$1.19 to \$9.68 and averages \$2.94. The Engineer states that from 1893-1913 the cost has been \$3.24-3.38 and averages \$3.32. Other cities do the same work for averages of from \$1.45 to \$1.73 per linear foot. These figures mean very little as conditions of sub-surface excavation vary with each foot. Newton pays an average of \$1.90 for cleaning each catch-basin which is much less than the average of \$2.48. It pays \$19.90 per mile for flushing and \$58.22 per mile for cleaning and repairs. These figures are low and much below costs given in other cities. Newton pays an average of 51c per linear foot for surface drains as against the usual cost of \$1.40 to \$3.20. The purchases of brick, cement, man hole covers and rims, house connection sets, vitrified pipe and sulphur are made in quantities and the prices obtained very favorable when compared with the open market. I find the prices for pipe from 20 to 40 per cent below those paid by many cities.

10. COLLECTION OF REFUSE

The collection of ashes and combustible waste is made by this department. No record is kept of the size of each load and only the number of loads and total estimated tonnage and total cost reported. From these figures it costs Newton \$1.81 per load or \$1.02 per ton for its collection and disposal while most cities are paying from \$1.50 to \$3.50 for the same service.

The equipment of this division consists of three yard carts with drop bottom and sides for ashes and low gear large body paper wagons with side and rear doors and holding about fifteen cubic yards. The receptacles for ashes are supposed to be of metal and not exceed 150 pounds in weight when full. Separate receptacles are used for waste. These requirements are not fully enforced and much time is lost by the collectors in sorting the materials. There is a lack of co-operation between the house occupiers and

collectors. Proper containers are not used. Many are insufficient, broken, unsightly and over-heavy. All boxes and wooden barrels should be excluded as they break easily and spill their contents about the street. The wagons should all be furnished with extra-size tarpaulin covers to prevent the contents being carried away by the wind.

The chief problem in this service is the length of haul to the dumps. These dumps are numerous and many are ample in capacity for many years. Some sections are well supplied and others as Wards 1 and 7 have none within easy hauling distance. The dumps are in general well kept and groomed. There is very little cause for complaint except at Homer street, Allison street in the rear of the Stearns School and at certain times at the Faneuil dump. Papers are usually burned promptly and none allowed to blow away. Sorting materials for coal or other valuable portions does not disturb the trimming and cannot be termed obnoxious.

An incinerator has been suggested to burn the rubbish collected and reclaim the valuable portions for sale and at the same time generate steam and electricity. A plant sufficient to care for the rubbish, exclusive of ashes, would cost approximately \$25,000 and would cost about \$10,000 a year to operate. This cost would include labor for sorting materials and feeding the furnaces, supplies, salaries and credit the amount of revenue for materials and power sold. The sanitary results obtained are the elimination of unsightly and unhealthy dumps and fires, and the physical results are the reclamation of some valuable material such as paper, rags, tin cans, glass, rubber and metals. The expense of installation and operation of this incinerator would not be justified with the small amount of rubbish collected in Newton. It is impossible to find one on the market that is efficient. All will turn out partially burned or only scorched material which must be put through again and all emit odors which are more objectionable than any number of dumps.

I believe the proper solution of the dump problem is the use of a motor tractor to haul the loaded teams to the dump. This would save much time in the long hauls and reduce the number of men and horses. At present it takes 20 per cent of the time to load, 40 per cent to go to the dump and 40 per cent to return. With a tractor the loading and hauling would be continuous. The cost of \$82.72 per day for collecting and trimming could be reduced to at least \$50 as the average of 80 tons collected each day could be done in less than one-half the time it takes at present. This would make a daily saving of at least \$30 and amount to nearly \$10,000 for the year which would more than pay for the purchase and maintenance of the tractor.

COSTS AND PURCHASING

The charts on the following page show the maintenance, construction and sanitation costs of Newton compared with the average for the seven Massachusetts cities.

The construction curve very clearly shows the policy of building permanent pavements in other cities and the falling off in Newton in the last three years in this expenditure. The maintenance curve shows the heavy cost of upkeep of bituminous macadam as well as the other functions of lighting and snow removal. The sanitation curve includes the street cleaning, sewer maintenance and collection of refuse and garbage. The collection of garbage is not under this department in Newton but is generally classified with the function of sanitation.

In making a study of the costs of a department two things are important—are prices reasonable and are the things purchased serviceable. I believe that serviceability is of far more importance than price and that the commissioner is keeping this point in view in his purchases.

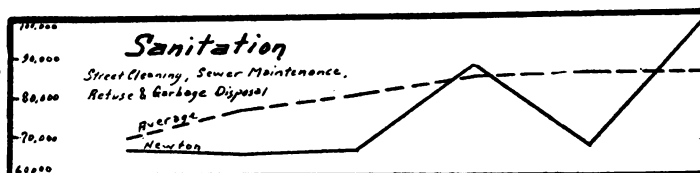
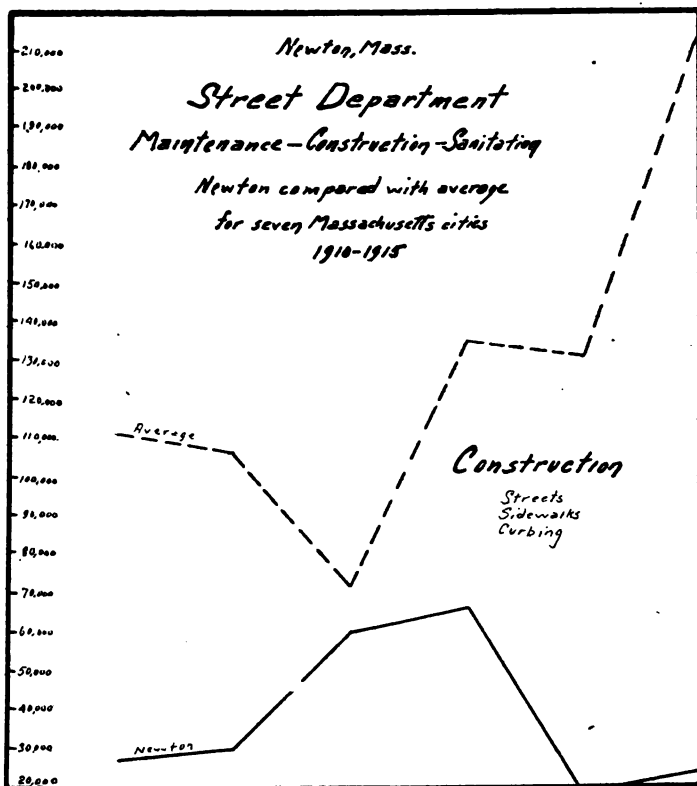
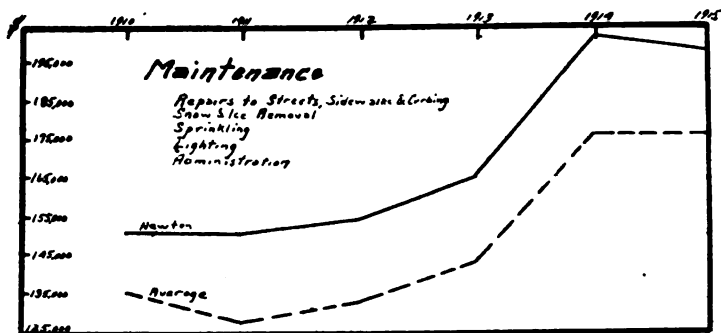
Contracts are made early in the year on competitive bids and for wholesale supply for coal, grain, hay, brick, tar and oils, sand and gravel, crushed stone, curbing and other sup-

plies. This practice has worked to great advantage this year and several thousands of dollars have been saved. The specifications offered are clear and standard and thoroughly worded and offer no opportunity for illegal bidding.

The following table showing the prices paid by the different departments and different cities for coal is inserted here and explains itself:—

GRADE	Street	School	Water	Poor	Fire	Library	Power House	Boston	Brookline
1915									
Egg	6.32	6.08	6.32	7.10	6.32				6.14
Pea		5.75							
Furnace		5.89	5.92		5.94				5.73
Cumberland	4.39				4.39				6.39
	4.70								3.45
	6.70								
Stove			6.27	7.10		6.52		3.86	
Chestnut				7.10					
New River		4.70	3.60						
King Philip			1.40						
Pocahontas							4.49		
Screenings			1.65						
			2.57						
1916									
Buckwheat		4.23				4.98			
Cumberland	5.25								
Egg	7.50	7.00	4.25		6.27				
Milton vein		4.39	4.75						
		5.02							
Bituminous	5.25								
	6.31								
Screenings									
Imperial			2.25					5.60	
Chestnut		6.52	1.55		7.50				
Furnace		5.89							

EFFICIENCY SURVEY.



CATTEN

Crushed stone is purchased at the rate of \$1.35-1.50 a ton delivered on the job or at the siding and is either the same or a lower price than is being paid by other cities. Gravel is purchased at 80c a cubic yard on the cars and freight paid by the city at about 40c per cubic yard.

I believe that the system of purchase by weight on delivery at siding should be employed. Stone and gravel vary in weight and measurement and there can be no fair set figures per cubic yard or per car load lot. It takes about 4.03 cubic yards of crushed stone per four inches deep square yard of surface to be covered and the streets should be built according to weight of stone and not guessed by the car load, automobile or cart body measure.

The prices obtained for road oils are very favorable and are practically the same as last year. Most of the quotations received on bids which were rejected showed an advance in the price of this article. The price paid for Tarvia X is the same at 8¼c delivered and applied. Tarvia B is at 7c or ¼c less than last year. These figures are below the prices paid in many cities for the same materials.

I have examined the prices paid for gasoline, iron pipe, kerosene, horse shoes, lanterns, lead, oil suits, picks, pitch, rubber boots, shovels and cement and find them either below or at the market prices of Boston at the time of purchase. Practically all of these prices have advanced from 10 to 50 per cent in the last six months and many of the purchases of this year might be made to extend over another six months or until there is a possibility of more favorable market conditions.

LABOR

The control which the commissioner has over the labor force of the department is one of the vital factors in the cost of operation. If he is competent and knows the local conditions of the labor market he should be given a free hand in the selection and control of his men unhampered by personal or political

influence. He should be held responsible for the results of his subordinates and laborers. He should be allowed to assign men to different tasks and even arrange for an interchange of laborers between departments. The waste time of the winter months could be greatly reduced by this interchange of experienced men held by the various departments throughout the year. He should have a method by which a fine might be imposed for certain infractions of rules. The policy of laying a man off for punishment is a farce and reacts on the discipline of the force.

Street work demands able-bodied, energetic, active and alert labor. The department is now honeycombed with from 8 to 10% of aged and decrepit men who are eligible for a pension under the law and who still draw \$2.50 per day and demoralize the rest of the force. The rate of work in a crew is always equal to that of its slowest and most inefficient unit. No man is going to work harder than another when all receive practically the same wage and are not rated for promotion by results attained. There should be a gradual elimination of the men who are sixty years of age and who have served their twenty-five years in the service. It would be a saving to give them their half pay pensions and employ one good man to do well the work that four old men were doing poorly. All new men employed should be placed on a minimum wage scale of \$2.00 for a period of probation. This would allow the commissioner some latitude in the selection of men and is found to work with satisfaction in the Fire and Police departments.

The laborers of this department are paid for actual time worked as recorded by the foreman on the daily time reports. The hours are from 7 to 4 in summer and 8 to 5 in winter with one hour for dinner. The time lost by laborers for various reasons amounts to 10-20% for construction, 25% for cleaners, 10% for sewer men, and 20% for ash collectors.

The labor force is 91.1% of the total payroll of the department and 20.52% of that of the city. The expenditure for personal service in this department is 40.36% of its total operation costs and is the fourth lowest in the city. Only Health,

Charity and Public Buildings expend a lower percentage for service. Results in engineering work depend on labor efficiency. The contractor figures his profit and loss in a gain or loss of individual labor efficiency. Figures covering the percentage of cost of labor to that of total operation of street department functions show variations according to the location of the city and condition of the labor market. I find that they vary all the way from 23 to 52% and the 40.36% average of this department for all service is about at the average.

RECOMMENDATIONS

Reorganization of duties of division foremen.

Inspection system installed.

New office cards for progress and recapitulation records.

Abolish Newtonville supply yard and Willow and Pettee street stables.

Establish new stable and supply yard at Winchester and Cook streets.

Build storage bins and tanks at the proposed yard.

Purchase one large motor truck for stone, one 2 1-2 ton truck, a spraying body, a sand spreading body and snow plow attachment, a motor sweeper, a tractor, and a runabout for Division C foreman.

Have more detail report of automobile use by the Heads of Departments.

Purchase stone rather than operate crushers.

Vest power to relocate poles in Street commissioner and Wire Inspector with the approval of the Mayor.

More careful protection of tools.

Better enforcement of street opening provisions.

Use of single trench for all house connections.

Larger and more uniform collecting carts for street cleaners

Rearrangement of street lamps and fixtures.

Cement grout for granite blocks of all car tracks at cross-overs.

Lay only permanent sidewalks.

Pay for crushed stone by weight delivered.

Probation period for all new laborers.

Pension all eligible laborers.

WATER DEPARTMENT

Organization and Jurisdiction

Office

Yards, Stables and Equipment

Methods of Operation

Collecting

Pumping and Storage

Distribution

Inspection

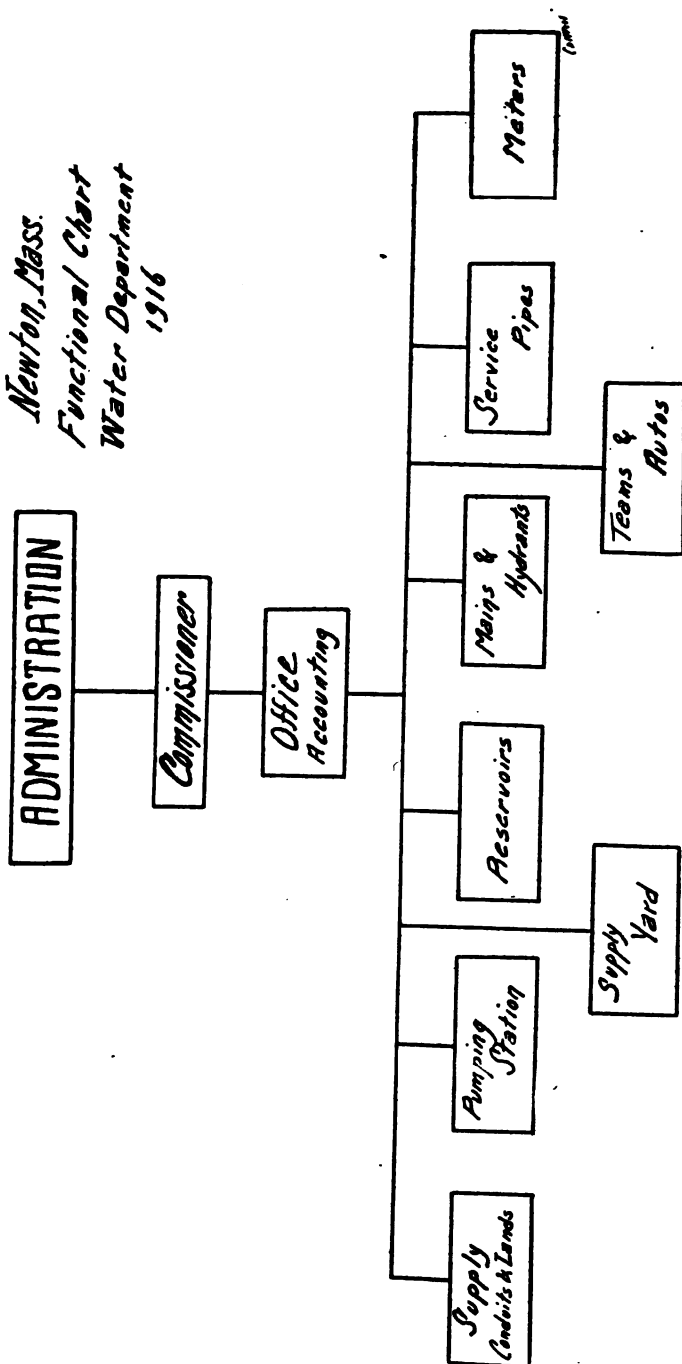
Costs and Purchasing

Labor

Finance and Charges

Recommendations

*Newton, Mass.
Functional Chart
Water Department
1916*



ORGANIZATION AND JURISDICTION

The organization of the water department consists of a commissioner, bookkeeper, two temporary office clerks, supply-yard clerk, three foremen, three inspectors, two pumping engineers, four firemen, and from thirty to fifty laborers.

Its jurisdiction as shown by the chart covers the collection, pumping, storage, distribution and sale of water. This is the one profit-making department of the city and the problems which it faces are different from those of other departments. It is difficult to compare the efficiency of its operations in the same manner used for other departments. The supply of water is a power in the upbuilding of the population of a city and no obstacles can be presented which would discourage property owners and land developers. It is a vital factor in guarding the health of the inhabitants and expenditures must be made to this end regardless of economies.

OFFICE

The office force is entirely adequate for the amount of work which it is called upon to perform. Chapter XXII of the Revised Ordinances requires that records be kept of all department doings; correspondence; work done, with kind, location, cost, and name of person to whom charged; name of each water taker, with location and description of building, character of water use, kind of service, quantity supplied and amount charged therefor; the amounts of water pumped daily, consumed daily and in store. I find that these books and records are adequately and currently kept. There are proper forms in

use for petitions for main pipe, guaranty for extension up to six inch pipe, release for extensions across private property, post cards for notice to connect, triplicate orders for connections to be made, daily time reports for each laborer showing his hours and character of work performed, post cards for complaints, triplicate requisitions for supplies and materials, meter inspection readings and records, and card index of water service pipe connections to all buildings. A map of the collection and distribution system is kept and shows all mains, services, hydrants, gates, etc. Meters are read quarterly and bills made out and sent by this office either semi-annually or annually according to the amount of water used. Duplicate bills are made out and a stub record of each bill retained. Collections are made by the City Collector and double payment is impossible.

The space allotted to this department for office purposes is entirely inadequate. It is the smallest and darkest office occupied by any of the large departments. The furniture and counter are antiquated and should be replaced. The vault is inadequate for proper storage of valuable papers. All correspondence is filed in pasteboard filing cases and these should be replaced by steel vertical files. I recommend the moving of the Forestry Department office (see later) and expanding the Water Department to the quarters it once occupied. This would provide an office for the commissioner and besides giving him privacy would relieve the crowded condition of the outer office.

YARDS, STABLES AND EQUIPMENT

This department maintains a separate storage yard and stable located on Watertown Street. This location is nearly a mile from the nearest railroad siding and requires a double handling of materials and supplies. The buildings of this departments are cared for out of its own revenue and not by

the Public Buildings Department as is the case with the other departments.

I find that the stable is in good condition and has adequate space for horses, storage of forage, stock rooms for meters and small parts, stop gates and larger parts, meter repair and testing rooms, and temporary space for a small automobile. The sheds are adequate for wagons and storage of hydrants but should not be used in their present condition for storage of the automobile truck and gasoline. A danger from fire exists at present which calls for instant action to prevent destruction of the buildings and damage to the contents. The yard is adequate for storage of pipe and an ample supply is on hand for future use.

The five horses and small wagons are in poor condition and should be replaced with a second small automobile truck for meter and leakage repairs. Two automobiles could do all the work now being done by one automobile and the five horses and wagons. Much time would be saved and the expense of upkeep and force of men diminished by this change.

There would be no advantage of proposing a change of this yard to another location nearer the railroad. The proposed Cook Street yard (originally owned by this department) is in a territory which is well supplied with new pipe and most of the future work of the department will come in repairs and replacements in the northern sections of the city. Space might be reserved at the proposed yard for some pipe storage and thus eliminate the double handling which is now necessary but creating a longer haul to the point of use.

METHODS OF OPERATION

1. COLLECTING

The water is collected from a well sunk in the Charles River and guarded by a catchment area of some seven hundred acres

on both sides of the river. This area is being reforested, adequately fenced and properly protected from all sources of contamination. Ice is not harvested on the area of collection. Permission has been granted by the State Board of Health for an additional taking of three million gallons and another well will be constructed to bed rock which will give even better water than that being skimmed off the top at present. Analysis is made every other month by the State Board of Health and shows an excellent quality of water. There is no turbidity or color, only slight sediment occurring at the spring and fall turnover, and a proper proportion of iron, chlorine and nitrates.

2. PUMPING AND STORAGE

The pumping station is located on the bank of the river about a mile and a half below the intake crib. The condition of this station is excellent although much of the machinery is antiquated. Adequate records of operation are kept to conform to the standards of the New England Waterworks Association and are found in the annual report of the commissioner. The Barr engine which does practically all the work is capable of furnishing a sufficient supply for the present storage facilities. With the double storage space now being constructed this engine will be overtaxed and should be supplemented by a new engine to take the place of the antiquated Worthington which can only be used for emergency purposes and requires constant care and frequent repairs. The Barr furnishes both low and high pressure and is being pushed to the limit to keep up with the present amount of consumption. The boilers are in excellent shape but have long ago passed the age of replacement and will need the most careful operation to perform the necessary work.

The men of this station have operated the sewerage pumping

station located at this point for nearly fifteen years. The two gasoline engines have given much trouble and are in constant need of repair and danger of being flooded. It is necessary to give from two to thirteen hours each day to this inspection and is too great a drain upon the water department. Much will be accomplished with the installation of an electric automatic pump connected with the electric plant of the water pumping station. This department should be paid for this operation by the Sewer Division of the Street Department. There is no reason why water takers should assist in the payment for labor to operate a sewage pump and I recommend that an annual charge of \$600 for labor and power be made against the appropriation for sewer maintenance and credited to the operation of the pumping station.

The water storage facilities will be adequate for many years with the completion of the two new units of the reservoir which will double the present capacity. This 10,000,000 gallons will leave a margin of safety over the daily consumption which was not possible in the hot or dry months of the year. The average daily consumption was 2,830,455 and this often reached the maximum of 4,000,000 gallons.

3. DISTRIBUTION

The system of distribution is well designed and properly maintained. I find by many inquiries that it is rendering satisfactory and adequate service. There are sufficient mains, stop gates and hydrants to supply the more thickly settled sections of the city and extensions and addition to these are being made rapidly. Modern methods are being employed. More stop gates and valves are being added to prevent the inconvenience to users of shutting off the supply to make connections or repairs, all hydrants are being supplied with six inch connections, dead ends are being eliminated, detector meters employed, gal-

vanized iron pipe is replacing lead service connections, service meters installed on 90% of the connections, and electrolytic action tests are being made.

This department lays its pipes without a permit from the street department as required by all others who wish to tear up the street surfaces. Report of this action is made and the trench backfilled by the department. These fills are inspected by the commissioner and at his request the street department accepts the work and resurfaces the street at the expense of the water department. Future house connections are not run to the property line on new streets or newly surfaced streets and I believe that this should be required by ordinance to prevent the constant opening of a finished street surface in newly developed sections.

4. INSPECTION

Three inspectors read the meters quarterly and inspect connections and fixtures only when there is suspicion of non-recording of the mechanism. These inspectors cover the same district each time and have in their possession cards giving the previous reading. This practice is open to serious abuse and allows the inspector to guess at averages rather than make actual readings.

Inspection for leakage in the mains is not made except when there are suspicions of loss. Venturi meters should be installed at selected points in the mains and the readings of pumpage, storage and consumption checked at certain periods. It is always the object of the department to lower the per capita consumption and eliminate waste by detecting leaks and preventing abuse of fixtures if possible and every step should be taken which would accomplish these results. Leakage is due to carelessness, poor workmanship or faulty material and it is to the credit of the department that there are very few detected leaks per mile of pipe.

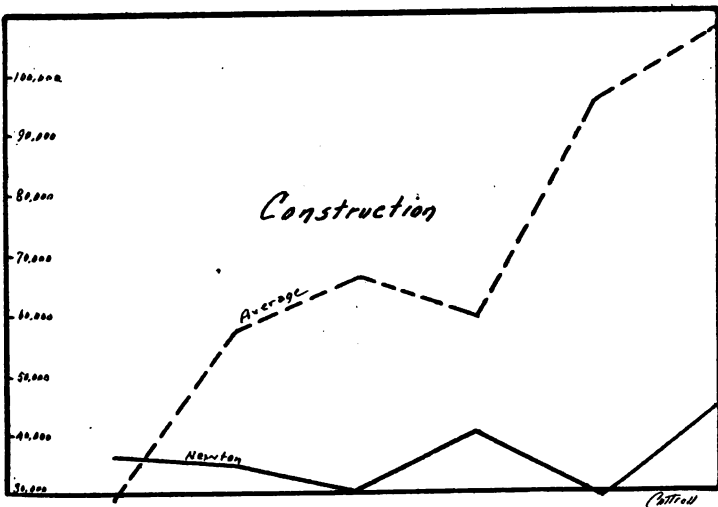
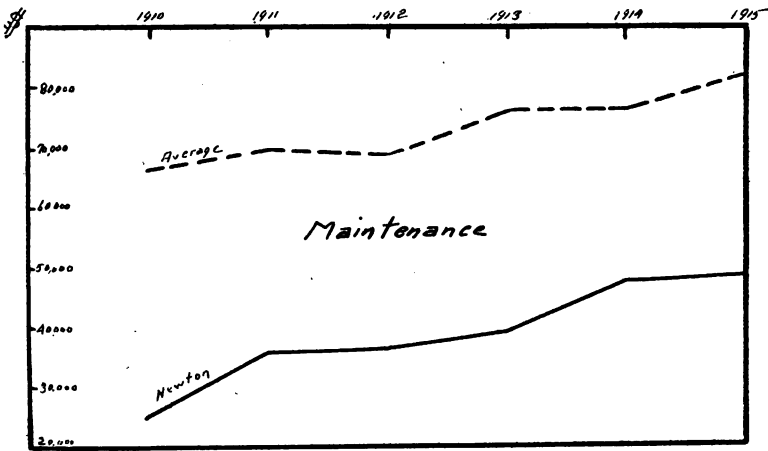
Newton, Mass.

Water Department

Maintenance and Construction
(exclusive of Metropolitan assessment)

Newton compared with average for seven Massachusetts cities

1910-1915



COSTS AND PURCHASING

The charts showing comparisons between Newton and the average for other cities give striking contrasts in both maintenance and construction expenditures. These differences are justified when an examination of the detail cost is made. The commissioner is a very careful spender and might even be called too provident in some cases. All purchases are made in quantity and on a favorable market. Purchases of pipe, castings, gates, meters, brick and coal were made during the last year on the best possible terms. Large quantities were purchased and supplies of all are on hand for at least another six months. Prices have advanced from thirty to one hundred percent on all of these supplies since the purchases were made and the commissioner should have credit for a great saving to the city. Practically all of the prices paid are below those paid by other cities with which comparisons were possible.

About twelve hundred tons of coal are purchased each year. This department pays less for its coal than any other in this section of the country. This is accomplished by buying at favorable times and at tide water. The rise in rates for water carried freight has forced the department to abandon this practice and it is now picking up available quantities when the occasion arises. The bins were well stocked before the threatened railroad strike and enough is on hand to carry the department to the next low price period. A mixture of 60% coal and 40% screenings is used and with skill in firing produces the boiler efficiency desired by the engineer. No analysis of the coal is made by the department but records are kept of the consumption and ash content.

The following table of figures from eleven cities where pumping is employed shows that Newton is tenth in efficiency and ninth in economy.

PUMPING STATION SUPPLIES

Statistics Available For 1915

City	Average price coal delivered	Efficiency Number of gallons per pound of coal	Economy Cost per million gallons
Newton	\$3.96	321	\$20.55
Haverhill	5.19	290	14.03
Fall River	—	577	8.39
Lawrence	5.09	523	39.83
Lynn	5.00	621	60.00
Woonsocket	5.04	454	15.28
Lowell	4.93	674	9.98
Pawtucket	—	659	8.54
Providence	4.37	961	4.78
Cambridge	4.38	720	7.27
Waltham	4.60	483	16.05
Average	4.66	571	18.24

Efficiency of a pumping plant is measured by the duty of a million foot pounds per one hundred pounds of coal consumed and its economy in the cost per million feet of water pumped.

Newton has a per capita consumption of 64.9 gallons daily which is a very safe working figure and below the average for the cities and towns of the Metropolitan district. A proper measurement based upon the amount pumped with piston slip, correct meters, leaks eliminated and "free" municipal water paid for by the departments, would go far to reduce the cost of operation and reduce rates. In 1915 the department laid pipe in sixty-nine localities. This pipe varied from two to twelve inches in diameter and cost \$24,380.37 against an estimate of \$25,335.00. Forty-five of these jobs were below and twenty-two exceeded the estimate in each case. The cost of laying per linear foot averaged \$1.20 3-4 as against \$1.41 for the previous year. Both of these figures are low for the type of excavation work necessary in Newton.

A table of figures for the past five years shows the safe

margin upon which the department is operating under the present rates.

Year	Operation	Construction	Interest	Receipts	Balance
1911	\$26,091	\$36,473	\$50,056	\$161,001	\$78,792
1912	33,902	25,638	49,918	157,324	67,230
1913	34,392	34,581	49,778	142,841	51,991
1914	41,665	32,161	47,638	159,882	64,358
1915	39,764	44,553	45,498	167,531	76,144

LABOR

This department employs an average of forty men, exclusive of office force, foremen, inspectors and pumping station force, at an average rate of \$2.61 per day. The hours of labor are from eight to five and the men are paid at their work by the paymaster for actual hours worked as recorded on the time slips of each man and signed by the foreman. The recent raise in pay affected thirty-three men. The Civil Service list has been exhausted during the past year and the general impression is that better men are being obtained outside of the restrictive limits. These men are usually of foreign birth and show from results that they are capable of doing more and better work than the usual laborer in a water department.

The force at the pumping station consists of two pumping engineers at \$35.50 and \$24.50 per week, a fireman and assistant pumping engineer at \$17.30 per week, and two firemen at \$3.00 per day each. These men work in eight hour shifts and are supervised in a most efficient manner by the engineer in charge of the station. This force is adequate for all present demands but if the new forty-eight hour law is accepted by the city it will require additional men to operate the plant in time of dry weather or some other emergency.

FINANCE AND CHARGES

The "pay-as-you-go" policy of this department provides that income from the sale of water shall cover interest, repayments, renewals, taxes, annual expenses for extension, operation, maintenance and engineering, and that no balances shall be used for other departments. This policy means that present water takers are paying for mains which will be used by posterity and should be bonded by the serial method and distributed over a series of years. All ordinary renewals and replacements may rightfully be paid out of current income. The addition to the storage capacity is being paid by serial bond issue and stands in the same relation to the present water taker as a main extension. Fairness to the water taker demands a change of policy at this point.

Another important matter to consider in this connection is the "free" use of water by all city departments which amounts to about 10% of the amount pumped. Here again the water taker is burdened with an expense which the taxpayers should bear. The departments should pay according to their use and this increased revenue would justify a still further reduction in rates.

Meters are now installed in the schools, police stations, fire stations, power house, garage, city hall, stables and playground buildings, but no charge is made for the water metered. Uses to which water is put and not metered are sprinkling parks, playgrounds and occasionally streets, flooding for skating, flushing sewers, fire hydrants, drinking and ornamental fountains, standpipes, puddling trenches, supplying steam-rollers and spraying trees. Reasonable charges for these items would be:

Playgrounds (skating, sprinkling, toilets, showers) ..	\$200
Parks (sprinkling, fountains)	100
City Hall	150
Police Station	150

Power House	150
Garage	100
Fire Stations	400
Fire hydrants at \$15.00	16,230
Streets (construction, sprinkling)	3,000
Streets (sewer flushing)	2,000
Streets (stables and buildings)	1,000
Schools	2,000
Fountains (bubblers)	1,200
Forestry (spraying trees)	2,000
	<hr/>
	\$28,680

In all of these items except street sprinkling the tendency in the use of water is upward and justice demands that these charges should be placed where they rightfully belong—on each department. There is a great waste of water when no meter is used and this method of payment would reduce consumption as well as introduce proper business methods of accounting.

The present rates for water are more than adequate to carry the department with all its attending burdens and the new rate effective in January could be still further reduced by the true accounting of the transfer of this municipal charge from the water taker who usually cannot bear it, to the taxpayers who would scarcely notice it.

On the basis of accounting results, revenue accruing, cost of operation, statistics collected and partial unit costs, I believe this department conducts its business both efficiently and economically.

RECOMMENDATIONS

More office space.

Modern office furniture and equipment.

Install meter history cards showing,—installation, changes, violations, tests, repairs, costs.

Police blanks for reporting defects.

Efficiency records of employees.

Seal all meters.

Change district of meter readers and have new card for each reading.

Comparisons reported of costs to deliver water and revenue derived therefrom.

New automobile truck for repair work.

New pumping engine to replace the Worthington.

New boilers.

Payment for operation of sewerage pumping station.

Bond issue for extension of mains.

Charges made for use of water by municipal departments.



FORESTRY DEPARTMENT

Organization and Jurisdiction

Office

Yards, Stables and Equipment

Methods of Operation

Insects

Trees

Trees and Wires

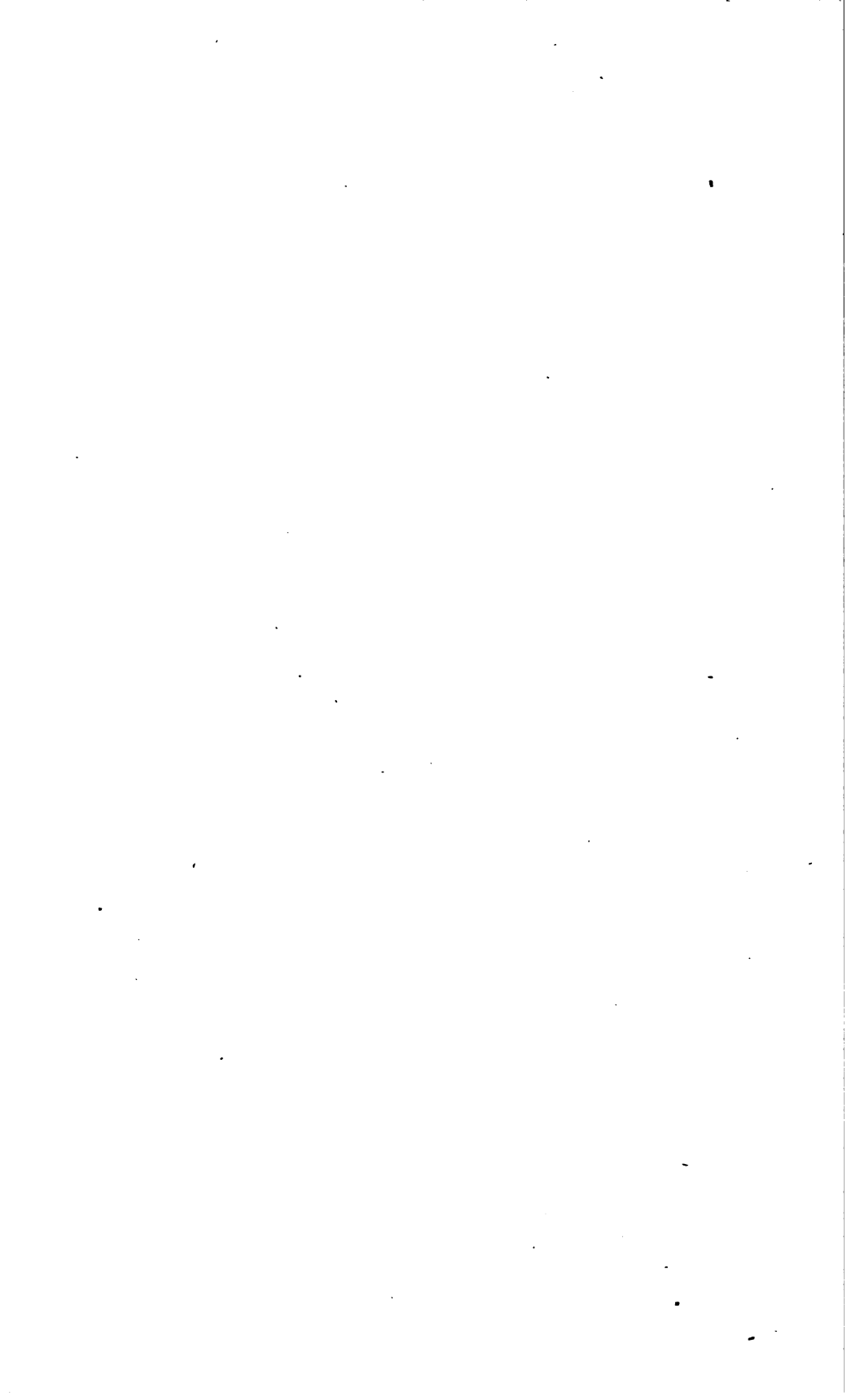
Parks

Playgrounds

Costs

Labor

Recommendations



ORGANIZATION AND JURISDICTION

The Forestry Department is composed of a commissioner, one clerk, one assistant clerk or stenographer, one foreman and from forty to one hundred laborers. Its jurisdiction as shown in the accompanying chart covers the care of all parks and squares, grounds of public buildings, school grounds, burial grounds, the destruction of insect pests, the raising, planting and care of trees and the indirect supervision of the care of playgrounds. These duties call for an infinite amount of detail and much more conscientious work on the part of the department than usually appears on the surface. There are at the present time about 108 acres of parks, squares, public building grounds and cemeteries divided into one hundred and forty different plots. These plots are widely separated as a glance at the frontispiece map will show. There are also 32,632 trees on the street line or within six feet of the sidewalk which comes under the direct control of this department. Private work for the preservation of trees and destruction of insects is also done at the request of the property owner and paid by assessment against the property. Moth work is done under the supervision of the State Forester and a portion of the cost paid by the state.

There is small need of enlarging upon the work of this department as the excellent reports of the last two years give much detail and are of a great value in educating the public in the knowledge of the operation of this scientific department. Newton is proud of its parks, playgrounds and trees and appreciates the aesthetic, economic and hygienic values to the city. All amounts expended for beautifying and maintenance are wise investments and will be appreciated by both the present and future generations.

The supervision of this department requires an arboriculturist who has been trained in forestry, horticulture, dendrology, plant pathology, entomology and landscape gardening. If a city desires to protect its trees and beautify its streets it must

have the knowledge and willingness to spend money in a scientific manner. The present commissioner has adequate training and experience and has built up a great system within his department. He has gradually reduced the cost of operation and increased the amount of work accomplished by effective organization of men and equipment. The great dangers of insect pests and diseased trees are being faced without much publicity of action and new problems are appearing each year, as for example, the pine tree blister and maple rust.

OFFICE

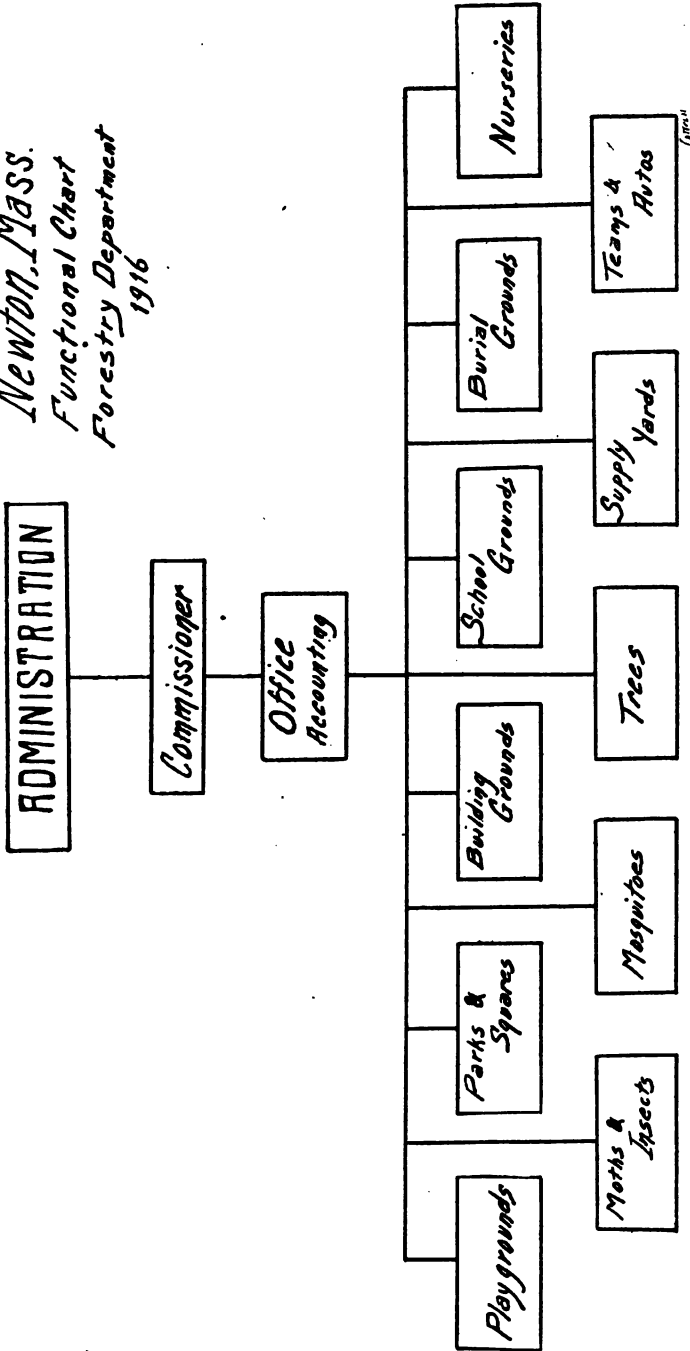
The office methods of this department are perhaps the most up-to-date and detailed of any in the city and certainly more so than any other forestry department studied.

The forms employed may be placed in three classes—State, City and Private accounts.

The State forms include a report of the work done in the destruction of gypsy and browntail moths showing the payroll of employees, schedule of bills and supplies received from the supply store of the State Forester; Civil Service Commission and Industrial Accident Board blanks.

The forms used in the city work include,—triplicate requisitions; duplicate requisition for foremen; employee's record; individual daily report showing time worked, unworked time, work done and supplies received; labor detail by foremen showing employee's time and materials used on each job; card index of foremen's work; moth spraying records of streets for the past five years; expenditures for each street for five years; monthly costs of labor, teams and materials; weekly automobile record showing machine number, time of start and finish, mileage, destination, object, expense incurred and remarks and certification; street record of shade trees having cards for inspection, census and work done, costs and detail by foreman; cash expenses for month; weekly team sheet; schedule of bills receivable; adjustment blank; and post cards for public hearings on removal of trees or for receiving a copy of the annual report of the department.

*Newton, Mass.
Functional Chart
Forestry Department
1916*



The private work records include,—notice of Mayor to property owners; moth inspection report sent to owner; inspection card posted on property; post card asking department to perform work or asking for an extension of time for work done by contractor; record of requests and complaints; card signed by owner to perform moth work; notice to foreman to perform work; memorandum of work done in duplicate showing detail of labor and materials; expenditures and liabilities for eight years; duplicate memorandum of private work; inspection certificate; inspection card posted on property; and bill sent to property owner.

The space allotted to this department for office purposes is entirely inadequate. This office is about fifteen feet square and contains three desks, three filing cases, and other small furniture. There is no possibility of privacy in the conduct of business. Space for keeping unused cards and other office supplies is lacking. There is no place for the proper protection of books, records and maps except a small vault in the basement. I would recommend that the suggestion made by the commissioner in his last annual report be carried out and a space provided for the Forestry and Playground departments in the old patrol quarters. There is adequate space here for one large main office, two small private offices, one consultation room for commission meetings, and adequate storage for department supplies, equipment or apparatus. Connections could be made with the heating and lighting plant and a passageway made to the main part of the City Hall. The total cost of this change need not exceed two thousand dollars if done during the winter months. This change would greatly benefit the Forestry, Playground and Water departments and provide each with main office quarters and the necessary privacy for the heads of departments in the conduct of their business.

YARDS, STABLES AND EQUIPMENT

The crowding of this department into the small space at the Newtonville supply yard has been mentioned under "Streets".

Inadequate and cramped quarters are a great detriment to efficient operation and I recommend that this department be given a building on space available in the Crafts street yard. This building should be especially designed and constructed to suit the peculiar needs of the department and properly care for the automobiles, trucks, sprayers, clothing, hose and tools. At present the large truck and runabout are stored in the machine shop and when not in use must be left in the open and exposed to heat or dampness. The sprayers are usually in the open and exposed to the elements or maliciousness of boys. Temporary space might be found for several of these sprayers at the proposed Cook street yard when work is being done in this section of the city.

The equipment of this department is in excellent condition and shows very little depreciation from its almost constant use. In case the work of the Playgrounds is given to this department, the foreman will need a small truck for the transportation of his men and tools. This is now done by horse and wagon and much time is lost in going from one piece of work to another.

METHODS OF OPERATION

The tree work of this department divides itself naturally into four classes:—

1. Providing trees and shrubs—

Nurseries are maintained to raise the necessary trees and shrubs. These are carried in the Supply Account and are saving from 20 to 25% on market prices. They are all in excellent condition but entirely inadequate for the demand upon them. Additional area should be provided either in Edmands Park or on the catchment area of the Water department for the cultivation of small stock as well as providing for the reforestation of these areas.

2. Future planning—

A tree census has been made and each block plotted on a

card which gives all the detail necessary to determine future planting or removal of trees. From this census a definite plan for the future treatment of existing trees, plans of planting, use of equipment, cost of maintenance and all other necessary details are worked out.

3. Culture—

Trimming and pruning, surgery for decayed trunks and limbs, and destruction of insect pests come under this class. The past season has been an excellent one for trees as they have been favored by an excess of moisture and the pests have been checked even if not destroyed by the climate.

The work of destruction of insect pests is a slow and expensive operation and includes the gypsy and browntail moths, elm tree beetle, leopard moth, canker worm, forest caterpillar and several others. All of these insects are decreasing with the exception of the leopard moth whose larvae must be removed much more carefully. The gypsy, browntail and elm tree beetle can all be reached by spraying during the spring and are easily poisoned by arsenate of lead. This is followed by another spraying in July or August if the browntails have not been reached on the first application. There is a great waste of material in the spraying process but in order to insure effectiveness it is best to put more time and material on the first application. It is necessary to visit each section twice as the equipment and crew organization for gypsy and browntail work are radically different and both cannot be destroyed by the same crew at one visit. The creosoting of egg clusters of the gypsy moth is a slow and sometimes ineffective process as many are concealed from view and require experienced men to search them out. The nests of the browntail moth are usually in plain sight and are easily destroyed. The destruction of this insect is as much a health measure as for tree protection as it affects many human beings with a rash from the poison which is carried by its hair tips.

This class also includes the study of the planting of new types of trees less susceptible to insect pests and diseases.

4. Prevention and protection—

The most important thing is to give the tree a chance to grow to its normal size and age. Guards placed to prevent the gnawing of horses and abrasion of vehicles are of great benefit. Many things affect natural growth such as sidewalks, impervious street surfaces, electric wires, leaky gas or sewer mains, and malpractice of private individuals. Many trees are ruthlessly butchered for purposes of running wires and pipes (see Lowell Avenue), many are destroyed by horses and automobiles (ninety-seven cases on Commonwealth Avenue alone this year), and many are taken out for building purposes or for safety of pedestrians. The educational value of tree work lies in the proper knowledge of the care of trees and the commissioner has done much in protecting trees through his annual reports and lectures to the schools.

TREES AND WIRES

Under the present charter and ordinances the location of poles is under the Board of Aldermen, the arrangement and supervision of wires under the Inspector of Wires, and the trimming and protection of trees under the Forestry Commissioner. This ordinance should require that all high tension wires should be insulated where passing through trees and on two feet each side of each tree and tested to carry a protection against at least 6500 volts. It should also provide that no new wires should be strung without the permission of the Inspector of Wires and the Forestry Commissioner. At the present time the electric companies follow the pole locations given by the Board of Aldermen irrespective of tree locations and sizes. One glance at the mutilation of the young trees on the east side of Lowell Avenue from Otis Street to Commonwealth Avenue will show the result of this practice. There are two great dangers present here. One is the burning through of large limbs where contact exists between the wire and the tree. The other is to the men of the department in treating the tree for insects

or trimming its limbs. One man has been killed and two incapacitated by shock and burn from contact with poorly insulated wires and at present the department refuses to send men into trees where there are high tension wires. The electric companies usually top all trees which are to be removed and the department removes the trunk. This is a good-will working agreement and should be embodied in the ordinances of the city. The department is fortunate in having one of its men of training and experience in electrical work and has made him Deputy Fire Warden and Deputy Wire Inspector thus combining the requisites of the proper solution of the problem. Power of ordering extension arms to carry wires around trees should be placed in the Forestry Commissioner acting with the Inspector of Wires.

PARKS

This department cares for all the areas of the city which might be classified as Parks. This includes the formal and informal areas of reserved land, grass plots at street intersections or street borders, school and public building grounds, and three small burial grounds, in all 140 different plots containing 108 acres. The performance of this function includes planting and cutting grass, planting and pruning trees and shrubs, maintaining formal gardens, paths and roadways, benches, fountains and signs. The function has been well performed and every formal area is a beauty spot in its environment.

Several points might be emphasized in this connection. More utilitarian areas are necessary. More benches, shelter houses or comfort stations should be provided and fewer "No Trespassing" signs placed on these beauty spots. The question is often asked why some twelve thousand dollars should be spent on park maintenance when beauty alone is gained. The lack of seating arrangements is the most noticeable feature of practically all of the park areas. The undeveloped areas of Auburndale and Edmonds Parks should be preserved as woodland and arranged for picnic purposes.

PLAYGROUNDS

Section 88a of the revised ordinances creates a Playground Commission for the operation of the playgrounds of the city.

Section 88b provides:—"The Playground Commission in carrying out the powers heretofore given so far as they apply to the permanent equipment and maintenance of playgrounds, shall arrange for such work to be done by the Forestry or other appropriate departments under the direction and control of the Playground Commission."

There are at the present time fifteen playgrounds with a total of 123.3 acres located as shown on the frontispiece map at Lower Falls; Auburndale; Webster and Eden in West Newton; Boyd, Allison, Stearns and Horace Mann in Nonantum; Cabot and Claflin in Newtonville; Centre and Langley in Newton Centre; Winchester in Newton Highlands; Upper Falls; and Waban.

The steady and continued patronage has abundantly justified the existence of this real force in the moral and physical up-building of the young people. The citizens realize the absolute necessity of an abundant opportunity for healthful supervised play and the training of a spirit of loyalty to the city which it engenders. These playgrounds are all maintained in excellent condition by a small force of men under the Playground Commission and paid out of its appropriation. The certification of the payrolls is done by the Supervisor of the Playgrounds and the Forestry Commissioner. The men are hired by the Supervisor and the tools are loaned by the Forestry department. There is a much larger proportionate cost of maintenance in the Playground department under this arrangement than is found in the Forestry department for the same character of work. This double jurisdiction is open to severe criticism. One of two steps should be taken, either amend the ordinance and place the entire maintenance under the Playground commission and avoid a dodging of the ordinance as at present worded, or, give the full power of caring for the grass, trees, shrubs, tennis courts, baseball diamonds, running tracks, but not buildings or

apparatus, to the Forestry department. I strongly advise the latter course. At present the Forestry commissioner cannot tell the amount of balance in the appropriation when he signs a payroll voucher and is unable to act without many inquiries. He cannot conscientiously swear to the payroll as he must take the word of the Supervisor that the amount specified is correct.

If the maintenance of the playgrounds were given to the Forestry department it would save the double overhead expenses, would give better organization, and would find more continuous employment for a well-constructed force of men for the entire year. At the present time both departments waste considerable time in sending two forces of men about the city to care for the two sets of widely separated grounds. One small force under one foreman supplied with a small automobile truck to carry men and equipment could do all the work more quickly and economically. This same force could be kept at a uniform size for the entire year by being employed in removing snow from the walks and skating surfaces in the winter.

A great saving could be made here in both the Forestry and Playground departments maintenance amounting to at least five thousand dollars and eliminating administrative friction and an illegal action at the same time.

COSTS

The chart showing comparisons of costs of this department with the general average is entirely misleading. Newton has given the Forestry department functions which are not found in the same departments in other cities. Other cities cover moth work and some shade tree work and in most instances do not have the area or tree growth which is found in Newton. The addition of the care of public grounds increases the burden of this department but at the same time takes the place of one or two separate departments of other cities.

The total cost of the department in

1914	\$66,778.
1915	63,981.
1916	52,237. for nine months and balance of \$12,293.

The destruction of moths consumes over half of the appropriation each year being \$42,710; \$34,356; and \$29,075 respectively. Reimbursement by the State and private individuals reduces this item more than half. This item should gradually decrease unless new and unforeseen conditions arise which bring other insect pests. The other items of the expenditure are far below what is necessary for the proper administration of the functions of the department. It is estimated that the total value of the trees in Newton is \$1,639,562, and that about fifty cents is spent on each tree which makes about one-half of one percent expended for upkeep. Labor consumes 55% of the total expenditure of the department. Materials and supplies are purchased at the lowest market prices (where not furnished at cost by the State) and I find that this department buys at lower prices than many others in this or other cities. The operation of nurseries has reduced the cost of new stock from 20 to 25% and a tree can now be raised, planted and guarded for a total of \$2.22 each. This is far below the cost in other cities or of private contractors for the same amount of materials and labor.

LABOR

This department employs from forty to one hundred laborers and pays an average of \$2.61 per day. Five rates of pay are used :—

11 men	at	\$3.20	per day		
2	"	"	3.04	"	"
9	"	"	2.72	"	"
21	"	"	2.56	"	"
56	"	"	2.50	"	"

This is the maximum number employed during the year.

These men are under the supervision of a most efficient and conscientious foreman who inspects each crew as often as possible each day. During this summer he has covered from 60 to 75 miles each day and some 12,000 during the past year. The commissioner also inspects the work and gives a greater proportion of his time to inspection than to office work.

Newton, Mass.

Forestry Department

*Newton compared with average for seven Massachusetts cities
1910 - 1915*

Average covers only Mth Extermination and some shade tree work.

*Newton includes also the maintenance of parks and squares, playgrounds,
school grounds, public building grounds, cemeteries, etc.*

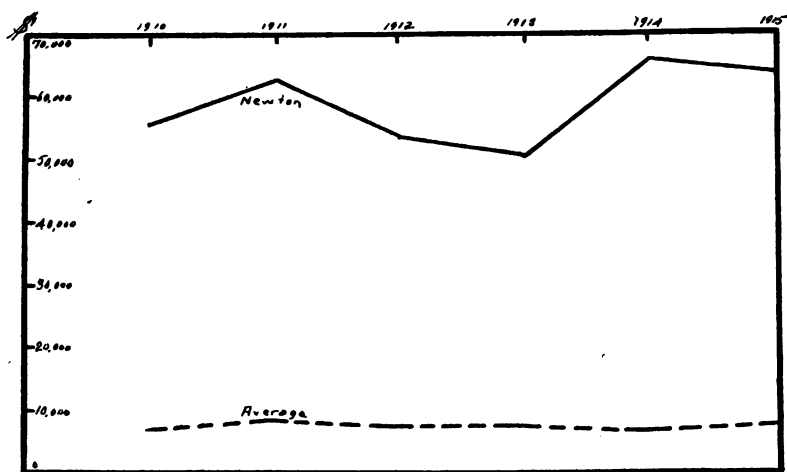


Chart 11

The hours of labor in this department are in summer from seven to twelve and one to four. In winter they are from seven-thirty to twelve and twelve-thirty to four. The men are paid for the actual time worked and by a paymaster who goes to each crew in the field. The labor time is recorded by the foreman of each crew and each man reports his time and character of the work performed during the day. A record is also kept of unworked time. The time of teams, automobiles and trucks is kept by the foreman and reported weekly.

The problem of getting efficient labor is an important one in this department. Skilled men are unwilling to work for the wages paid by the city when private contractors in tree and moth work are paying from three to four and a half dollars a day. Men are employed under the Civil Service Law, trained as climbers, sprayers, etc., and then leave for private work in the summer. When this work is completed they again register under the Civil Service Laws and are automatically replaced in the eligible list for appointment. The recent raise in pay to the lowest scale men did much to hold the number of men necessary to operate the department through the summer. It has been found through the experience of the last few years that about ten men out of the fifty or more employed are skillful and efficient enough to retain as part of the permanent force of the department. This means much lost time in training new men in a more or less scientific type of labor and the efficiency and esprit de corps of the last six months speaks very highly for the commissioner and foremen in this department.

RECOMMENDATIONS

New office space provided.

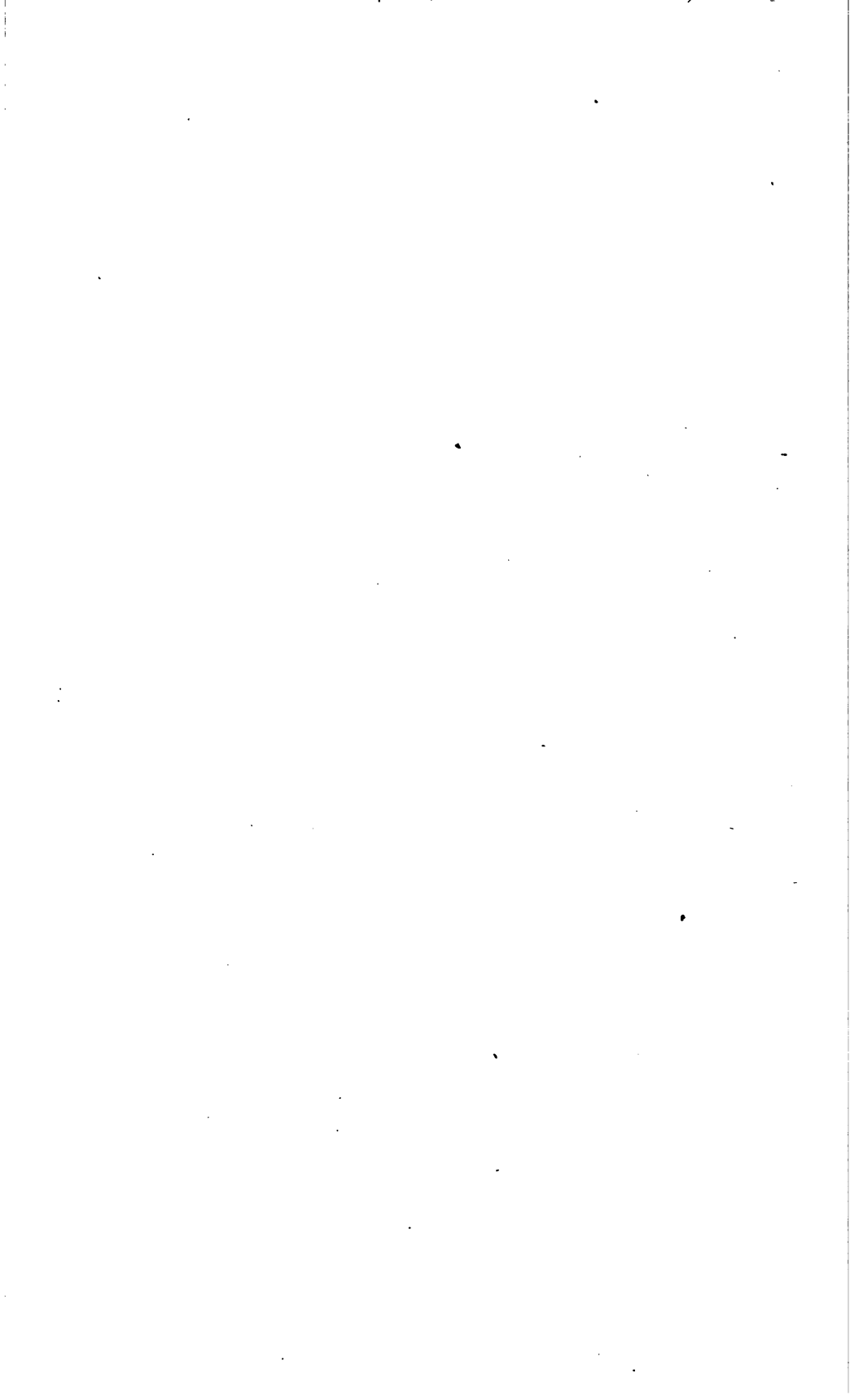
New building for equipment.

More power in locating of electric wires.

Parks fitted for use by the people.

Playground maintenance placed under this department.

Small automobile truck for park and playground maintenance.



HEATING AND LIGHTING PLANT



Municipal Heating and Lighting Plant

A study of the cost of operation and maintenance of the power house was made at the request of Your Honor.

This plant is primarily for furnishing heat to the City Hall, Police Station and Court House, and the Municipal Garage. The engine and dynamo are operated as a secondary consideration when much light is needed by offices during the dark days of the fall and winter months or the late meetings of the board of aldermen and its committees. The voltage furnished by the Edison company is watched and recorded and when a certain point is reached the municipal plant is switched on with the purpose of carrying the heavier load at a reduced cost and thus saving a large expenditure. The engine is run on the direct steam pressure and the heating done on the back pressure which makes for more economy of use and less useless radiation in the buildings. Tests have been made at various times to determine the difference in the use of coal with and without the operation of the engine. It is found that there is practically no increase in the coal consumption with the operation of the engine when the boilers are performing the heat function and the use of direct pressure steam does not seriously affect the amount of heat furnished.

It is not possible to operate the engine during the summer months when only a small fire is carried under one boiler for emergency purposes. Heat is needed in the Police Station on cold nights, and in other buildings during certain days in May, late August and early September. There may be an emergency where light would be needed for office work or board meetings and the pressure could be raised to respond to this demand in a short time.

Coal is purchased on contract in July and delivered in fifty ton lots at the plant. The price in 1915 was \$4.49 per ton, and in 1916 \$5.60 per ton delivered, which is above that paid for similar coal by other departments.

The cost of operation of this plant covering a period of years is shown in the following table:—

	1910	1911	1912	1913	1914	1915	1916**
Labor	2553	†	†	3102	2378	2356	1280
Fuel	1694	†	†	1718	1906	1955	1041
Supplies	*	†	†	340	505	87	6
Repairs	*	†	†	341	—	95	61
Maintenance	*	†	†	2595	768	272	8
Total	4247	6722	7000	8096	5557	4765	2396

* Under Public Buildings and not segregated account

† Under Executive Department and not segregated account

** Six months

Three men are employed to operate this plant. One engineer from October to May, one assistant engineer and one fireman for the entire year do practically all repairs and overhauling as well as the operating. The condition of the boilers and engine are a great credit to these men and worthy of special commendation. The rate of pay in the case of the engineer has decreased from \$1080 in 1905 to \$988 for 1915. That of the assistant engineer has remained the same for the ten year period at \$840, while the fireman receives \$780 per year.

The hours of labor are arranged on the forty-eight hour basis and provide for one man—

8 A. M. to 4 P. M. five days per week,
8 A. M. to 12.30 P. M. Saturday,
9 A. M. to 12.30 P. M. Sunday.

the second man—

4 P. M. to 11 P. M. five days per week,
5 P. M. to 11 P. M. Saturday and Sunday and
one extra hour during board meetings.

the third man—

1.10 A. M to 8 A. M.

This schedule cannot be carried in the winter months as it is necessary to fire between eleven and one at night and impossi-

ble to divide the work among the three men on the forty-eight hour basis. The new eight hour and forty-eight hour per week law for workmen on public work, if accepted by the board of aldermen and the mayor, will require a readjustment of this schedule unless there is a voluntary expression on the part of the men themselves to perform the additional labor. If this is impossible under the interpretation of the law, then the use of one of the janitors of the City Hall as an extra fireman is possible under the following schedule:—

One man	8 A. M. to 2.40 P. M. for six days
Janitor	2.40 P. M. to 6.40 P. M. for six days
Second man	6.40 P. M. to 1.20 A. M. “ “ “
Third man	1.20 A. M. to 8.00 A. M. “ “ “

On Sunday—three shifts of eight hours each.

An examination of the lighting fixtures in the buildings furnished by this plant shows that many are poorly located and ill adapted to the use they are expected to perform. There is an excessive and unnecessary use of light in many of the offices. Poor and antiquated lamps, glazed bulbs and poor reflectors choke from forty to fifty percent of the light furnished and add to the increased cost of the voltage. The total connected load of these buildings is 25,800 watts with the present lamps. A readjustment of fixtures or replacing with modern lamps will cut this load to 12,395 watts or over one-half the present load. In 1915 the Edison company furnished 6696.8 kilowatt hours at the flat rate of ten cents per kilowatt hour. The city furnished approximately 12,000 kilowatt hours and all necessary lamps. This makes a total of 18,669.8 kilowatt hours consumed in all the buildings. The lamp readjustment would reduce this consumption to about 9,000 kilowatt hours and if the Edison company assumed the entire load would charge ten cents per kilowatt hour and furnish the necessary lamps.

Another factor to be considered is the use of fans during the summer months. At the present time these fans can be operated only on the Edison circuit and if there is a dark and hot day when the municipal plant is turned on the fans become useless.

Occasions such as this are rare and it is best to rely upon the Edison current for the fans rather than transform them to the municipal current. The fans are largely used when the municipal plant is being overhauled or run on low pressure and it is best to adhere to the present arrangement.

Measuring together the necessity for heat, the proposed saving on the connected load, the recent repairs and overhauling of the plant, the readjustment of working hours, the employment of the force in summer work, the amount of the new rate which the Edison company would charge, and the need of the plant in case of an emergency, I would recommend that:—

1. The Power House be transferred to the Public Buildings Department where it properly belongs,
2. The city continue its lighting plant and test the improvements,
3. The fixtures and lamps be changed to fit the schedule which I have submitted in a separate memorandum,
4. Operating cost records be kept to show labor, supplies, fuel, materials, time employed, current furnished, performance of dynamo and boilers, depreciation and overhead charges,
5. A charge be made for light and heat against each building furnished and credit given the power house account.
6. One City Hall janitor be licensed and assigned as assistant fireman to cover the provisions of the new law,
7. The employees of this plant be used as steam fitters on public buildings during the summer months for the examination and repair of furnaces and boilers. An enormous saving in the maintenance of buildings can be made in this one item alone and would employ the time which is not necessary at the power house during the slack season. This saving would more than pay the wages of three men for the entire year.

PURCHASING

PURCHASING

Section 28 of the Revised Charter provides that—"All officers and boards shall have charge of the making of contracts in their respective departments. Every contract *** of \$500 or more shall be in writing, accompanied by sufficient bond *** approval of Mayor is necessary *** and deposited with the City Clerk."

Section 21 of the Revised Ordinances reads:—"Before any contract shall be made by any officer or board when the amount involved is one thousand dollars or more, such officer or board shall, unless the mayor gives a written authority to do otherwise, invite proposals therefor by advertising in not less than two newspapers published in said city of Newton, such advertisements to state the time and place for opening proposals in answer to said advertisements and reserving in said invitations the right to the officer or board to reject any and all proposals."

The purchase of supplies, materials and equipment is a most important part of the operation of the city. There is a great waste in purchasing where so many departments are on the market at the same time with different forms of specifications and different methods of supply. This is particularly noticeable in the prices paid by the various departments for such common purchases as coal, grain, hay, etc., and is shown under the section of "Costs." Modern business practice advocates the central purchasing agent and I recommend that there be established in Newton a Board of Contract and Supply to consist of the Mayor, Solicitor, Comptroller, Engineer, and Purchasing Agent (to be created). The charter provisions noted above could be amended to cover this provision or could remain as at present by having the Board of Contract and Supply act in the capacity of centralizing and unifying and allow the officers and boards to issue the invitations and open the bids according to the provisions stated.

The purchasing agent could also act as central payroll clerk and be given room in the office of the Comptroller but not neces-

sarily attached to his office force. There is safety in having the purchasing and auditing functions in separate hands but the duties are overlapping and intimate association is necessary to give the Comptroller a check on purchasing and storekeeping which he does not have at present.

The advantages of this system are:—

1. Uniformity—of contracts, specifications, classification of goods, requisitions, invoices, etc.
2. Orders—maintenance of price fluctuations and taking advantage of seasonable purchases, competitive bids offered to wider range of vendors, large orders more attractive to vendors, "split orders" prevented.
3. Saving—Make discounts uniform throughout all departments, get quantity discounts of 7 to 10 percent, get discounts on cash payments within ten days of from 2 to 6 percent, reduce cost of advertising and printing, reduce office cost in maintenance of market information, relieve Mayor and Heads of Departments of much detail.
4. Testing—inspection of all deliveries and deduction for failure to meet standards specified. This method is the surest guarantee for obtaining the best quality in purchases. It was formerly practiced but given up for some reason by many of the departments.
5. Storehouse—A central storehouse (usually the objection to this system) is not needed for this work. The present storerooms and yards are adequate and periodic deliveries of bulky articles are possible.
6. Inventories—Fluid or at least monthly inventories should be kept to prevent surreptitious abstractions from the storerooms and yards. There is no check on the purchasing power of the department at the present time except the annual inventory made by the department and the signature of the storekeeper stating that the goods have been received.

It has been proved in many cities that central purchasing, testing and checking will make reductions of from ten to fifty percent in expenditure and Newton could have saved for all departments about twenty thousand dollars in the last year. This system naturally implies cooperation between the department heads and I believe that it is found established by the present accounting system.



LABOR

Percentage of Labor in Departments

Mental versus Physical Labor

Restrictions Upon Employment

Conditions Found

Contract versus Day Labor

Standardization of Salaries and Wages

Supervision

Recommendations



PERCENTAGE OF LABOR IN DEPARTMENTS

The item of salaries and wages or "Expenditures for Personal Service", shown in the table and chart on the next two pages, amounts to 62.18% of the total expenditure for operation of the departments. Criticism is often brought against departments that they are overloaded with executives. This cannot be shown in the three departments studied in Newton. Those in the "mental" division or "executive" capacity in the following table include the commissioner, office force, supply clerks, engineers, superintendents and foremen.

Payroll of Sept. 23, 1916	Street	Water	Forestry
Mental division	8.9%	13.9%	7.0%
Physical division	91.1%	86.1%	93.0%
Total pay roll	\$4,578.14	\$984.09	\$936.81
Total employees	294	58	57
Average rate per day	\$2.74	\$2.82	\$2.74

RESTRICTIONS AFFECTING EMPLOYMENT

Many factors enter into the problem of municipal employment. Civil Service requirements and other statutes accepted by the city in recent years have gone far to increase this expense. Legislation of this nature is looked upon from two points of view and particularly emphasized as a great social advance. It includes half-holidays, vacations, and limited sick leave with full pay. Veteran preference, citizenship, permanent employment for reasonable time, discharge only under almost impossible conditions, short emergency employment, and no transfer between departments are specified under the Civil Service laws. The eight hour law and its recent amendment the forty-eight hour law will increase the number of laborers necessary to accomplish a given result. Political influence has many times increased the payroll in excess of needs

Relative Amounts Paid For Operation and Personal Service Compared With Number of Employees—1915

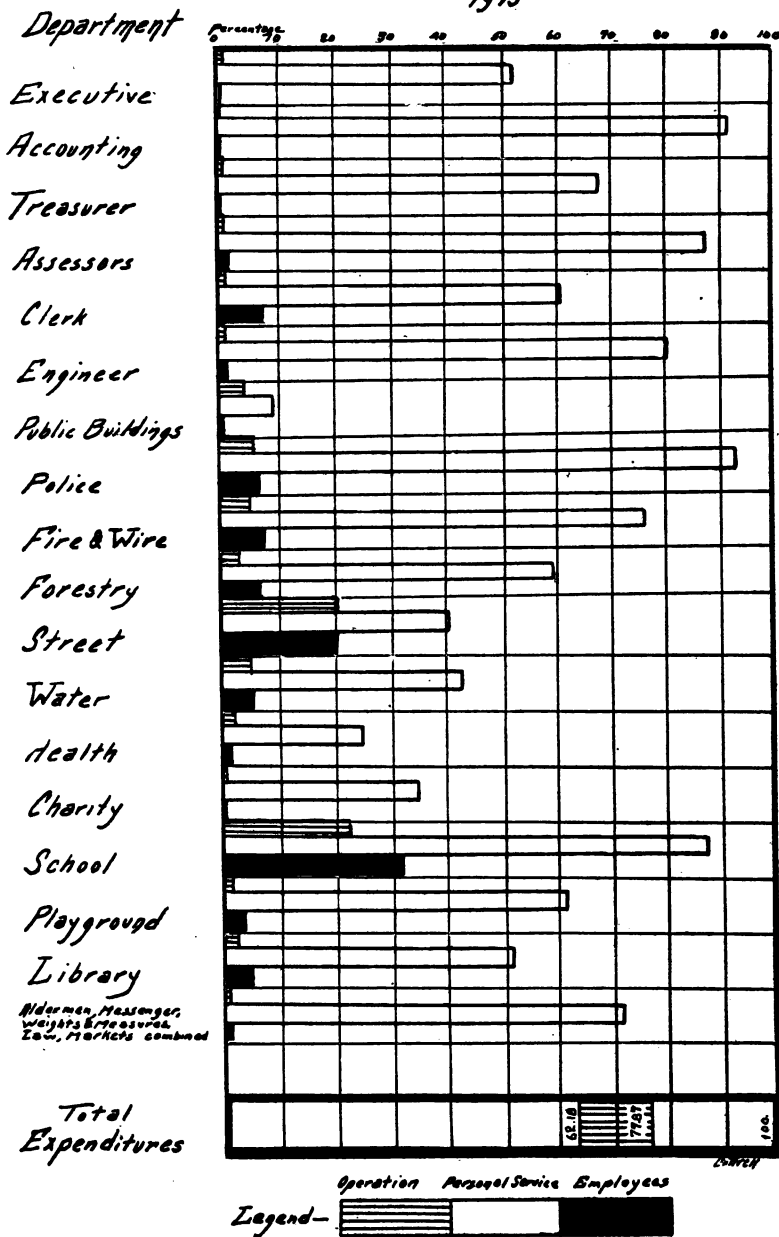
(See Chart Following)

Department	Total Expenditures for Operation	% of Total Expenditure	Expenditure for Personal Service	% of Total operation	Maximum Employees	% of Total
Executive	\$15,723.55	0.89	\$8,023.80	51.03	9	0.67
Aldermen	1,200.00	0.06	1,200.00	100.00	1	0.07
Accounting*	6,592.05	0.37	6,048.74	91.76	4	0.30
Treasurer**	10,715.50	0.61	7,338.10	68.48	5	0.37
Assessors	16,038.64	0.84	13,285.57	83.34	14	1.06
Clerk***	13,963.70	0.79	8,535.00	61.12	103	7.69
Messenger	1,652.62	0.09	1,200.00	72.59	1	0.07
Engineer	12,434.62	0.70	10,069.26	80.97	14	1.05
Public Buildings	64,435.01	3.64	6,113.00	9.48	5	0.37
Police	104,105.79	5.88	96,277.19	92.48	94	7.02
Fire	96,807.92	5.41	73,141.43	76.33	100	7.46
Weights & Measures	1,516.39	0.09	1,000.00	65.96	1	0.07
Forestry	63,981.35	3.62	38,007.55	59.40	91	6.80
Health	43,402.19	2.45	11,154.00	25.92	23	1.71
Streets	369,620.49	20.88	149,212.22	40.36	275	20.52
Charity****	15,571.73	0.88	5,430.89	34.94	7	0.52
School	392,328.56	22.16	341,499.45	87.04	422	31.50
Playground	19,445.68	1.10	12,061.42	62.02	39	2.91
Water	92,890.09	5.25	40,075.81	43.14	75	5.60
Law	4,984.94	0.28	3,262.27	65.43	2	0.14
Library	31,471.14	1.78	16,472.77	52.34	49	3.66
Markets	1,681.29	0.09	971.36	57.76	6	0.45
Total	\$1,378,665.45	100.00	\$850,379.78	63.04 Average	1340	100.00
	= 77.87%		= 62.18%			

ADD FOR TOTAL EXPENDITURES—

* Military Aid, Workmen's Compensation, Laborers' and Veterans' Pensions	\$8,951.18
** Interest Sinking Fund and Serial Bonds	352,654.70
*** Soldiers' Burial and Relief	2,022.00
**** Poor Out of City Home and Worthy Mothers' Aid....	28,395.60
TOTAL EXPENDITURES FOR 1915—	\$1,770,324.23

Newton, Mass.
Relative Amounts Paid for Operation and Service
Compared with the Number of Employees
1915





and destroyed the discipline of the department by forcing out the ambitious and competent employee.

During the greater part of this year Newton has faced a situation very rarely met. Wages of labor have increased in many industries and the newly arrived laborers have returned to their native countries to enter the war. This great stringency has resulted in an exhaustion of the Civil Service lists and a consequent employment of any laborers who would work. Not enough were obtained but those employed were in many instances stronger physically to handle the arduous duties of public work and officials testify that better work has been done per man than in recent years. The recent increase of wages to \$2.50 per day for the purpose of holding employees and attracting others is a situation rarely found in municipal work. It created a means of arbitrary demands for higher wages which the city will find hard to refuse. The law of supply and demand does not operate freely here as wages once established are never reduced and hours once shortened are never lengthened to adjust the number of laborers to the amount of work to be accomplished. This raise in pay has made conditions more uniform in the departments where similar work is performed. It was also much appreciated by the men and was reflected particularly in the amount of work accomplished since it went into effect.

CONDITIONS FOUND

Both open and secret observations have been made of the laborers in the three departments and the conditions found are far above most municipalities. Much time is lost in going to work or waiting for materials on the work. Work should begin promptly at the specified time unless the assignment for the day is doubtful. The practice of leaving the stable at the beginning of the labor period or returning in order to reach there at the end of the period should be discontinued. This occurs only in certain cases and is fortunately not a general practice.

Observations taken at various times between March and October show

	Secret	Open
Working time	60%	80%
Wasted time	30%	10%
Waiting for materials	10%	10%

It is a fair estimate of Newton labor to say that there is about 20% of the payroll expense which can be figured as wasted time, compared with 50-60% in other cities. These observations are based upon time checks made of similar departments in other cities and of private contract work of the same character. Lack of interest and slow action on the part of the laborer account for much poor and inadequate service. Inadequate service accounts for disintegrated macadam, filthy streets, obstructed sewers, leaky mains, insufficient backfill in trenches, slovenly parks and increasing insect pests. Thus there is the double expense of poor labor and high maintenance. This condition is sometimes due to the restriction of the Civil Service laws which require no real labor tests, no records of work done, no comparisons between the different laborers or different departments and really create dependence, listlessness and incompetence at the expense of initiative, energy and ability. Old men, unable to do a full day's work or protect themselves from the dangers of their occupation, lower the efficiency of the entire service. Two things are possible,—transfer all old men to the maintenance of parks and playgrounds where the work is comparatively light, or pension them off and employ stronger men in their places. There would be a great saving in either method.

There are two conditions which demand prompt action on the part of the administration. The law allows vacations and half-holidays with full pay. The half-holidays are a pure gift on the part of the city and are probably well earned. The vacations should be taken during the slack season and not when municipal work is at its maximum. Much inconvenience was caused by this practice among the foremen during the past summer and it tends to demoralize the work, place a heavy

burden on other members of the department and is a direct loss in efficiency. This vacation is taken with the approval of the Mayor and is within his discretion to set the time. I am in favor of the highest rate of wages which can reasonably be paid for an eight hour day with half-holidays in summer and two weeks vacation in winter. This means that during the laboring period the full eight hour day must be worked and the basis of compensation be full pay for full work and not higher pay and fewer hours.

I find no indication of padded payrolls, attempts to manufacture work or spread work thinly to gain time, and I am lead to remark again that the laborers of Newton are far more conscientious than those found in other municipalities.

CONTRACT VERSUS DAY LABOR

Practically all cities have tried both types of labor in construction work and the reports vary in different cases. It is usually considered that day labor of the city properly supervised will give better results although costing a trifle more. The testimony of city engineers is that large jobs are best done by contract as cheaper labor is employed, more work is accomplished in a given time and poorer materials are used unless properly inspected. City labor is best for small jobs although it is usually overpaid, less efficient, works fewer hours, lacks discipline and initiative, and uses more costly materials. There is usually a better result in the end as the pride of accomplishment is strong in the foremen and more conscientious of the workmen.

There are no dependable figures of work in Newton to make comparisons. Sidewalks and sewers are sometimes laid by contract. The city has not tried direct labor on the same type of sidewalk laid by the contractor and has no figures of cost. The laying of a sewer must be watched as the work progresses to determine the problems solved or proper records made of these problems and the unit costs compiled for future use. An attempt was made to compare the Thompsonville sewer laid by

contract with the work done by the city but the figures obtained were vague and inconclusive. I firmly believe that Newton will obtain better results on all small jobs by the direct labor method properly supervised and inspected.

STANDARDIZATION OF SALARIES AND WAGES

Many inconsistencies are found in a study of the rates paid by different departments for salaries and wages for the same character of work. The following table shows the rates paid in three periods. The important points to observe are that practically all salaries have remained the same or have been slightly advanced while wages have risen much more rapidly.

Salary and Wage Comparisons—1905, 1910, 1916

General Government	1905	1910	1916
Mayor	\$2,500	\$2,500	\$2,500
Mayor's Secretary	780	884	886
City Clerk	2,400	2,400	2,300
Assistant City Clerk	—	1,300	1,350
Treasurer	2,887	3,250	3,500
Auditor (Comptroller of Accounts)	1,800	1,800	3,200
Solicitor	3,500	3,500	3,200
Messenger	1,200	1,200	1,200
Public Buildings Commissioner	1,500	1,800	2,350
Engineer	3,000	3,000	3,200
Clerk of Committees	700	1,000	1,200
Protection of Life and Property			
Fire Chief	1,800	1,800	2,000
Firemen	(call) 2.00	(call) 125	1,200
Police Chief	*2,000	2,000	2,500
Policemen	1,095	1,095	1,200
Forestry Commissioner	—	2,300	2,500
Forestry Laborers	—	1.75-2.25	2.50-3.20
Education			
Superintendent of Schools	4,000	5,000	4,500
Librarian	1,500	1,500	2,500
School Janitors	960-2,180	900-1,920	294-1,856
Highways			
Commissioner	**3,750	4,000	3,400
Deputy Commissioner	1,900	2,000	—
Division Foreman	1,300	1,500	1,400
Division Foreman	1,300	1,500	1,500

EFFICIENCY SURVEY.

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Highways Continued	1905	1910	1916
Division Foreman	—	—	1,300
Sewer Foreman	1,196	1,196	1,400
Chief Clerk	1,000	1,000	1,100
Assistant Clerk	780	728	835
Stockkeeper	936	936	1,100
Foreman and sub-foreman	2.75-3.00-3.25	same	3.25
Machinist	3.50	"	4.00
Blacksmith	2.25-2.50-3.00	"	3.00
Engineer	2.25	"	2.75
Double teamsters	2.25	"	2.50
Single teamsters	2.00	"	2.50
Graders	2.00	"	2.50
Stablemen	2.00	"	2.50
Laborers	1.00-1.75	1.75	2.50
Power Plant			
Engineer	1,080	1,140	988
Assistant Engineer	840	870	840
Fireman	—	15.00	780
Water			
Commissioner	2,300	2,300	2,500
Clerk	832	832	939
Engineer—Pumping Station	***1,400	1,400	1,860
Fireman	***728	821	1,275
Assistant engineer	3.00	3.00	1,274
Assistant fireman	2.00	2.25	2.47
Clerk Pipe Yard	1,200	1,300	1,300
Foremen	2.75-3.00-3.25	same	3.25-4.00
Inspectors	2.75-3.00-3.25	"	3.25-3.50
Caulkers	2.25	"	3.00
Rockmen	2.00	"	2.50
Laborers	1.75-2.00	"	2.50

* and team

** and two horses and carriage

*** and house

There seems to be no rule which covers the salary or wage based upon duties performed. An indefinite minimum and maximum appears when the positions of secretary, clerk, bookkeeper and stenographer of all the departments are compared. Similar duties receive widely varying compensation in different departments. I would recommend a classification of all municipal employees into five grades with a minimum rate of pay at entrance and maximum rate established by sub-grades and measured by efficiency tests. These grades would be:—

1. Administrative—heads of departments
2. Supervisory—superintendents, division foremen, bookkeepers, and secretaries
3. Fixed responsibility—clerks, foremen, engineers
4. Skill and accuracy—storekeepers, bookkeepers, stenographers, inspectors, janitors, foremen
5. Routine—laborers

This plan should not be carried too far or made too rigid as it is impossible to make men efficient by system. Proper grades instill initiative and the individual will return more efficient work if he is sure that the reward is mechanical and not based upon influence either within or without the department.

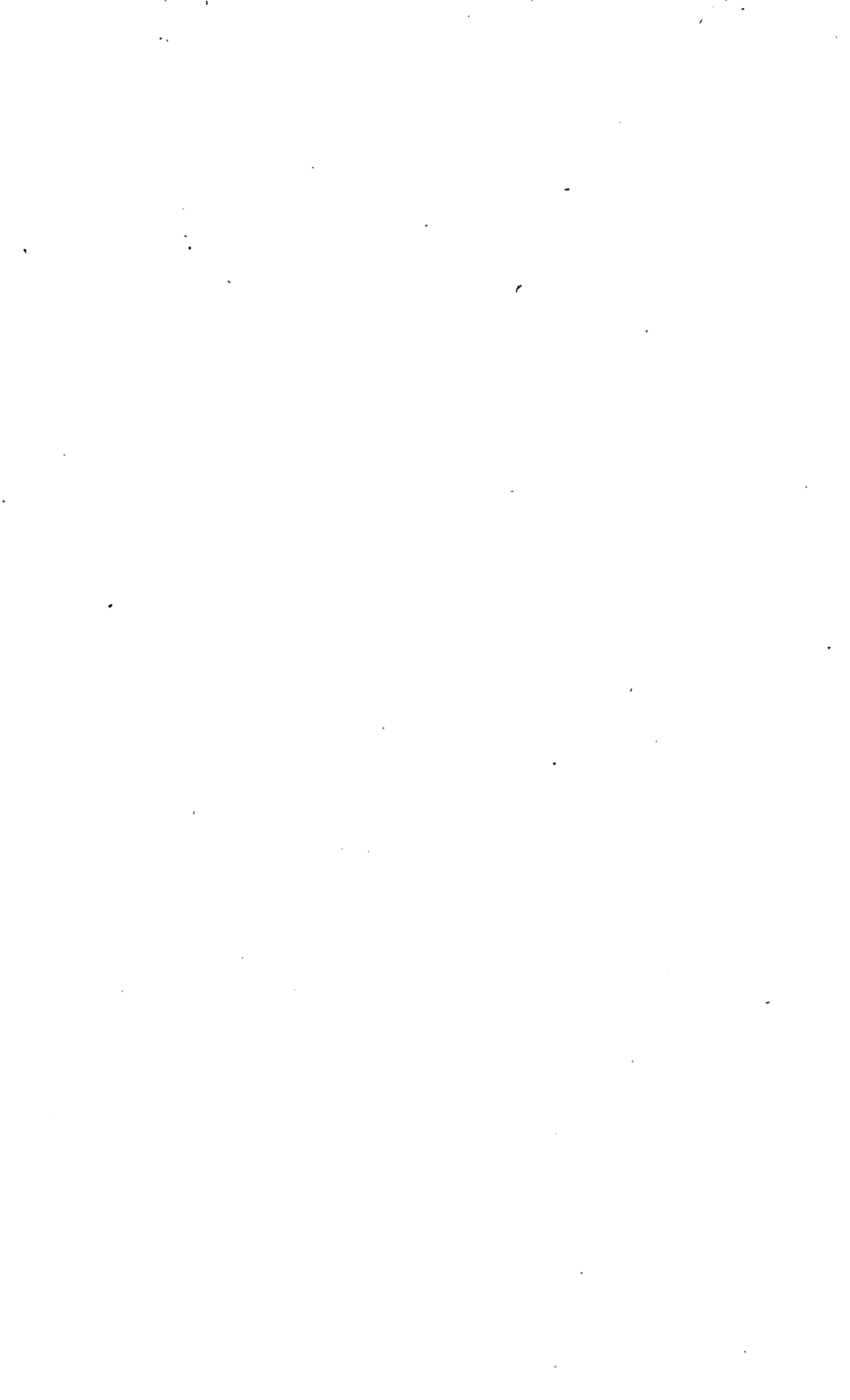
SUPERVISION

The best results of labor are obtained under experienced administrators and proper methods of supervision. This implies a knowledge of the problems of the work to be done, proper work plans to save time in making assignments, minimum organization of labor force to attain maximum amount of work, proper enforcement of discipline, adequate and accurate records of work accomplished, service records of proficiency of laborers and a feeling of co-operation which raises the incentive and increases the efficiency of the individuals of the department. I find that many of these factors exist in the three departments studied and that misdirected energy, unnecessary employment and low-grade service are conspicuous by their absence.

RECOMMENDATIONS

Vacations given in slack season.
Transfer old men to parks and playgrounds maintenance.
Standard for salaries and wages.
Efficiency records for employees.
Conference of foremen on work methods.

SUMMARY OF RECOMMENDATIONS



SUMMARY OF RECOMMENDATIONS.

GENERAL GOVERNMENT

- More uniform annual reports
- Establish bureau of information

ACCOUNTING

- Bring all departments to the detail and exactness of those studied and save large amounts through purchasing and controlling functions
- Establish cost records in department offices
- Monthly inventory reported and recorded in property ledger
- Discount all bills at two per cent for fifteen day payment
- Establish the office of central payroll clerk
- Pay all employees personally through treasurer or paymaster
- Charge depreciation of equipment
- Use item of "unworked time" in all departments where labor is employed
- Increase "overhead" in all accounts to at least fifteen percent

STREET DEPARTMENT

- Reorganization of duties of division foremen
- Install inspection system
- New office cards for progress and recapitulation records
- Abolish Newtonville supply yard and Willow and Pettee street stables
- Establish new stable and supply yard at Winchester and Cook streets
- Build storage bins and tanks at proposed yard
- Purchase one large motor truck for stone, one 2 1-2 ton truck, a spraying body, a sand spreading body and snow

plow attachment, a motor sweeper, a tractor, and a run-about for Division C foreman
Have more detail report of automobile use by the Heads of Departments
Purchase stone rather than operate crushers
Vest power to relocate poles in Street commissioner and Wire Inspector with the approval of the Mayor
More careful protection of tools
Better enforcement of street opening provisions
Use of single trench for all house connections
Larger and more uniform collecting carts for street cleaners
Rearrangement of street lamps and fixtures
Cement grout for granite blocks of all car tracks at cross-overs
Lay only permanent sidewalks
Pay for crushed stone by weight delivered
Probation period for all new laborers
Pension all eligible laborers

WATER DEPARTMENT

More office space
Modern office furniture and equipment
Install meter history cards
Police blanks for reporting defects
Efficiency records for all employees
Seal all meters
Change districts of meter readings and new card for each reading
Comparisons reported of costs to deliver water and revenue derived
New automobile truck for repair work
New pumping engine to replace Worthington
New boilers
Payment for operation of sewerage pumping station
Bond issue for extension of mains
Charges made for use of water by municipal departments

FORESTRY DEPARTMENT

- New office space provided
- New building for equipment
- More power in locating of electric wires
- Parks fitted for uses of people
- Playground maintenance placed under this department
- Small automobile truck for park and playground maintenance

HEATING AND LIGHTING PLANT

- Transfer to Public Buildings Department
- City continue lighting its buildings and test improvements
- Change fixtures and lamps to suit schedule appended
- Install operating cost records
- Charge each building for light furnished
- Rearrange labor schedule to fit provisions of new law if adopted
- Use employees during summer months in making repairs

PURCHASING

- Establish Board of Contract and Supply and Purchasing Agent

LABOR

- Vacations given in slack season
- Transfer old men to parks and playground maintenance
- Standard for salaries and wages
- Efficiency records for employees
- Conference of foremen on work methods



CONCLUSION



CONCLUSION

Much of the material accumulated in a survey of this sort is of value in bringing to the minds of the citizens, city officials and employees, the exact relation existing between them. There is, without doubt, a very great improvement in the work of the past year which it is impossible to measure. The moral effect of a survey of existing conditions or of a constant supervision by the executive authorities is responsible for more service by the same number of employees and the same amount of equipment, and the presence of better materials, which are reflected in increased returns and measured in treasury balances at the end of the year.

Administrators naturally prefer to head an efficient department and all with whom I have come in contact in Newton are striving for the utmost efficiency even to the point of closeness and false economy. Each has training and experience in his particular line and is displaying the greatest honesty and best intentions in the performance of his duties. Each is emphatic that outside influences and political pressure must be removed from his department and that petty district or ward considerations are the bane of public welfare and can make good administrators impotent and ineffective. The mere fact that publicity is given to his work assures that what he undertakes will be of the greatest value to the people whom he serves.

An increasing population brings many vexatious and pressing problems and demands a more active interest of the electorate. If results are demanded which require a higher type of administrator, then there can be no sidestepping of responsibility on the part of the legislative body. Increased study and travel has widened the scope of demands and increased the standards by which municipal work is measured. The public expects service for the whole city and is beginning to realize that it is usually the poorer sections and those who cannot shift their burdens who suffer most from excessive expendi-

tures and receive the least direct benefits. The citizens will insist upon responsibility and responsiveness to public demand when they realize the importance of training, equipment and temperament as the requisites of decreased expenditures in the municipal departments.

I have found that the heads of departments are carrying on their work with courtesy and tact and are performing many unpleasant duties fearlessly, impartially and conscientiously. There seems to be a loyalty and co-operation between some of the officials of the city which is necessary to a proper working of its intricate machinery. The new methods of accounting have caused some friction but are an indispensable contributory factor to good business. There is a constant danger from becoming too systematized and having too many rules, regulations and forms. Time is a valuable element and the continuous following of system sometimes leads to an entanglement in red tape which is both wasteful and inefficient. This criticism could be brought against some of the detail of the present accounting system, and yet, on the other hand, there are certain points of slack which must be taken up to insure the proper supervision and control of expenditures contemplated in the ordinances.

I have found an entire absence of criticism of superiors and the most harmonious relations exist within the working forces of the departments. Many employees have impressed upon me the excellent work which certain superiors are doing and in all cases I find these statements coming from pure fidelity and not with intent to influence. There has been a willingness to accept suggestions of change and listen to results or experiences of other cities where any improvement might be made.

Notwithstanding the fact that many suggestions are made for further promoting the efficiency and economy of the administration, it is my firm belief that Newton approaches more nearly to the ideal community government than any of the cities with which comparisons can be drawn. Newton has fewer officials at the head of departments, is receiving more and better service from her officials and employees, is operating

on a more competent, efficient and economical basis, and has a more intelligent and wide-awake electorate than is usually found among American cities.

It is usual in a report of this sort to mention only the things which are open to adverse criticism but in this case the good work of the officials has left little to blame and a great number of things to praise. Lack of time or jurisdiction prevents my making an examination of some matters of considerable importance which have naturally come to my notice. Seasonable work like removal of snow and ice and flushing of sewers is obviously beyond my study. The relations existing between some of the departments, in some cases amounting to extreme friction, are beyond my power to criticise. The overlapping jurisdiction of certain officials should receive the attention of the executive and board of aldermen. Many matters of financial interest need adjustment to conform to the new budgetary system of appropriations and accounting. These and other minor matters will adjust themselves in time but are expensive while they last.

To the officers and clerks I wish to express my appreciation of the cooperation given and assistance rendered in the preparation of this report, and to all employees of the city with whom I have come in contact I wish to express my thanks for their courteous treatment and reception of my questions.



**Memorandum
For Rearrangement
of
Lamps and Fixtures**



Memorandum for Re-Arrangement of Electric Lamps and Fixtures

C—Carbon M—Mazda				
CITY HALL	Existing	Change	Saving	Remarks
Room	Lamps	to	in Watts	
<i>Third Floor</i>				
Draughting	5-100M			
	2- 60M	10- 25M	520	Injurious to eyes—re-
	3- 50C			flectors poor
Tracing table	7-100C	8- 25M	550	Should be parallel to
	1- 50C			glass
Blue-print room	1-100C	1- 25M	75	
Store room	2-100C	2- 15M	170	
Stairs	2- 60M	—	—	
Gallery	4- 50C	4- 15M	140	
<i>Second Floor</i>				
Toilet	2- 50C	2- 15M	70	
Stairs down	1- 40M	—	—	
Smoking room	1-100M			
	1- 60M	4- 15M	190	Higher fixtures
	1- 40M			
	1- 50C			
Store room	2- 50C	2- 15M	70	
Aldermanic chamber	4- 50C			
	16- 60M	4-100M	760	One in each fixture
(Front)	4- 60M	Abolish	240	Unnecessary
(Under gallery)	3- 50C	3- 15M	105	
Store room (front)	1- 60M	—	—	
	1- 50C	1- 15M	35	
Playground office	1-100M	1- 60M	40	
	1- 60M	1- 50M	10	
Hall	3- 50C			
	1- 25M	4- 15M	115	
Stairs down	1-100M	1- 50M	50	
Committee room	2-100M	—	—	Indirect
(small)	1- 25M			
	1- 50C	3- 15M	135	
	1-100C			
Committee room	2- 40M	3- 15M	95	
(small)	1-100M			
	1- 50C	1- 25M	25	At desk

**Memorandum for Re-Arrangement of Electric Lamps and
Fixtures—Continued**

Solicitor	1- 40M	1- 25M	15	
	1-100C	1- 15M	85	
Messenger	1- 40M	—	—	
<i>First Floor</i>				
Stairs up	1-100M	4- 40M	60	
	1- 40M			
At door	2- 40M			
Outside globes	2-150M	2-100M	100	Glazed globes loss 50%
Corridor	5- 40M			
	2- 60M	10- 15M	270	
	1- 50C			
	2- 25M			
Mayor (outer)	1-100M	2- 40M	120	
	1-100C			
(inner)	1-100M			
	1- 40M	4- 40M	180	
	2-100C			
(toilet)	1- 50C	1- 15M	35	
Forestry	2- 50C			
	2-100M	4- 25M	200	New reflectors
Assessors	6- 50C			
(back room)	1- 40M	9- 25M	235	New shades
	2- 60M			
(vault)	2-100M	—		
	1- 40M	1- 25M	75	Diffusers not shades
	1- 60M			
(main room)	2- 60M	—	—	At counter
	1-100C			
	1- 25M			
	1- 40M	6- 25M	215	
	1-100M			
	2- 50C			
(toilet)	1- 50C	1- 15M	35	
(office)	2- 25M	—	—	Change reflectors
Clerk	1-100M			
(inner)	1- 40M	2- 25M	200	Change reflectors
(outer)	1- 40M			
	5-100M	—	—	Indirect
(vault)	1- 50C	1- 25M	25	
	1-100M	—	—	
	1- 30C	1- 10M	20	
Water	1-100C			
	5- 50C	7- 25M	200	Very dark room
	1- 25M			More flood light

**Memorandum for Re-Arrangement of Electric Lamps and
Fixtures—Continued**

Comptroller (inner)	2- 40M	1- 40M	
		1- 25M	15
(outer)	1- 50C	Abolish	50
	1- 60M		
	3- 50C	7- 25M	215
	2- 40M		
(vault)	1-100M		
	1- 60M	—	—
	1 30C	1- 10M	20
Toilets	2- 60M	2- 40M	40
Entryway	1- 50C	1- 15M	35
Treasurer (inner)	1-100M	1- 15M	85 Telephone booth
	1- 60M		
	1- 40M	2- 25M	50
(outer)	6- 40M		
(vault)	3-100M	10- 25M	290 New reflectors
	1-100M	—	— Place lights on both
	1- 25M	1- 15M	10 sides of wicket and at
	1- 30C	1- 10M	20 bill box
<i>Basement</i>			
Stairs up	1- 60M	1- 25M	35 If raised to ceiling
Store room	1- 50C	1- 15M	35
Engineer (inner)	1-100M	1- 40M	60
	1- 40M	2- 25M	140 Abolish cluster
	3- 50C		
(outer)	4- 50C	6- 25M	310
	1-100M	1- 60M	
	2- 60M		
(vault)	4- 60M	2-100M	40
	2-100M	2- 60M	80
	1- 50C	1- 10M	40
Instrument room	1- 50C	1- 15M	35
	2- 60M		
	1- 40M	3- 25M	85
Hall	1- 40M		
	1- 60M	4- 15M	240 Higher fixture
	2-100C		
Health (front)	2- 50C		
	1- 60M	4- 25M	110
	1-blank		

**Memorandum for Re-Arrangement of Electric Lamps and
Fixtures—Continued**

(middle)	1-100M	1- 60M	40	
	1- 60M	1- 25M	35	
(back)	1- 50C	1- 25M	25	
	1-100M	1- 60M	40	
(vault)	1- 60M	—	—	
	1- 50C	1- 10M	40	
Weights & Measures	4- 50C			
	1-100M	6- 25M	100	
	1- 50C			Extension cord
Public Buildings	1-100C	1- 25M	75	
(main)	2- 50C	2- 15M	70	
	2- 60M	2- 25M	70	
	1-100M	1- 60M	40	
	1-blank	1- 25M	25	
(inner)	3- 60M	3- 25M	105	
(vault)	1- 50C	1- 10M	40	Inner same as Health
(closet)	1- 60M	1- 25M	35	
Toilet	1-100C	1- 25M	75	
Stairs up	2- 60M	2- 25M	70	
Toilet	1- 60M	1- 25M	35	Place on ceiling
Streets	2- 50C	Abolish	100	
(inner)	1- 60M	—	—	
(outer)	2-100M	1- 60M	140	
	3- 60M	4- 25M	80	
(back)	1-100M	1- 60M	40	Replace
(vault)	3- 50C	3- 15M	105	
	1- 15M	1- 10M	5	
Charity				
(hall)	1- 40M	1- 25M	15	
(outer)	2- 60M	2- 25M	70	
	2- 50C	2- 15M	70	
(middle)	3- 60M	3- 25M	105	
(back)	1- 60M	1- 25M	35	
	3- 50C	3- 15M	105	
	1- 25M	—	—	
Pub. Bldgs. Fume	4- 60M			
Room	1-100M	5- 15M	280	
Cellar	3- 60M			
	6- 50C	10- 25M	230	
	1-100M			
(vault)	1-100M	1- 25M	75	
(outside)	1- 50C	1- 25M	25	

**Memorandum for Re-Arrangement of Electric Lamps and
Fixtures—Continued**

GARAGE—

Police patrol	3- 60M	3- 25M	105	
(outside)	1-100M	—	—	
Garage proper	6- 50C			
	1- 60M	9- 25M	335	Extension cords for re-
	2-100M			pair work

POLICE STATION AND COURT HOUSE

Office	1- 10M	—	—	
	3-100M	3- 60M	120	
	3- 60M	1- 50M		
	2- 50C	3- 25M	145	
		1- 10M		
Toilet	1- 50C	1- 15M	35	
Telephone booth	1- 50C	1- 15M	35	
Chief	2-100M	2- 40M	120	
	1- 60M	1- 25M	35	
	1- 50C	1- 15M	35	
Private room	2- 60M	2- 40M	40	
	1- 25M	1- 15M	10	
Guard room	6- 60M			
	1- 50C	4-100M	10	Cut off stems and use large lamps and re- flectors
Stairs up	5- 50C	5- 15M	175	
Cellroom	5- 50C			
	1- 10M			
	1- 40M	9- 10M	310	
	2-blanks			
	1- 30C	1- 10M	20	
Hall	1- 10M			
	1- 40M	2- 15M	20	
Entry and porch	2- 50C	2- 15M	70	
	2-100M	—	—	Change globes
Inspector	3-100M	3- 40M	280	
	4- 60M	4- 15M	180	
	1- 50C	1- 15M	35	
	1-100C	1- 25M	75	
Court House—				
Hall and stairs	1- 10M	—	—	
	1- 60M	—	—	
	2- 60M	6- 25M	170	
	4- 50C			

EFFICIENCY SURVEY.

Memorandum for Re-Arrangement of Electric Lamps and
Fixtures—Concluded

Court room	24- 50C	4-100M	800	Cut off clusters
Battery room	24- 50C	4-100M	800	
Toilet	2- 50C	2- 15M	70	
Three offices	2- 50C	2- 15M	70	
Basement	4- 50C	4- 15M	140	
	1-100C	1- 25M	75	
	1-100M	1- 25M	75	
	3-100M			
	1-100C	4- 60M	160	
POWER HOUSE	5- 40M	—	—	May not be exact as
	2-100M	—	—	lamps read thru win-
	3- 25M	—	—	dow. Distribution
				needed at important
				points.
TOTAL WATTS	At present	New plan	Saving	
	25,800	12,395	13,405	



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